

**Scientific Consensus on**

# **Maintaining Humanity's Life Support Systems in the 21st Century**

Information for  
Policy Makers

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# ESSENTIAL POINTS FOR POLICY MAKERS

## Scientific Consensus on Maintaining Humanity's Life Support Systems in the 21<sup>st</sup> Century

Earth is rapidly approaching a tipping point. Human impacts are causing alarming levels of harm to our planet. As scientists who study the interaction of people with the rest of the biosphere using a wide range of approaches, we agree that the evidence that humans are damaging their ecological life-support systems is overwhelming.

We further agree that, based on the best scientific information available, human quality of life will suffer substantial degradation by the year 2050 if we continue on our current path.

Science unequivocally demonstrates the human impacts of key concern:

- **Climate disruption** — more, faster climate change than since humans first became a species
- **Extinctions** — not since the dinosaurs went extinct have so many species and populations died out so fast, both on land and in the oceans.
- **Wholesale loss of diverse ecosystems** — we have plowed, paved, or otherwise transformed more than 40% of Earth's ice-free land, and no place on land or in the sea is free of our direct or indirect influences.
- **Pollution** — environmental contaminants in the air, water and land are at record levels and increasing, seriously harming people and wildlife in unforeseen ways.
- **Human population growth and consumption patterns** — seven billion people alive today will likely grow to 9.5 billion by 2050, and the pressures of heavy material consumption among the middle class and wealthy may well intensify.

By the time today's children reach middle age, it is extremely likely that Earth's life-support systems, critical for human prosperity and existence, will be irretrievably damaged by the magnitude, global extent, and combination of these human-caused environmental stressors, unless we take concrete, immediate actions to ensure a sustainable, high-quality future.

As members of the scientific community actively involved in assessing the biological and societal impacts of global change, we are sounding this alarm to the world. For humanity's continued health and prosperity, we all — individuals, businesses, political leaders, religious leaders, scientists, and people in every walk of life — must work hard to solve these five global problems, starting today:

1. Climate Disruption
2. Extinctions
3. Loss of Ecosystem Diversity
4. Pollution
5. Human Population Growth and Resource Consumption



Illustration by Cheng (Lily) Li

# OVERVIEW OF PROBLEMS AND BROAD-BRUSH SOLUTIONS

## CLIMATE DISRUPTION

*Reduce effects of climate disruption by decreasing greenhouse gas emissions, and by implementing adaptation strategies to deal with the consequences of climate change already underway.* Viable approaches include accelerating development and deployment of carbon-neutral energy technologies to replace fossil fuels; making buildings, transportation, manufacturing systems, and settlement patterns more energy-efficient; and conserving forests and regulating land conversion to maximize carbon sequestration. Adapting to the inevitable effects of climate change will be crucial for coastal areas threatened by sea-level rise; ensuring adequate water supplies to many major population centers; maintaining agricultural productivity; and for managing biodiversity and ecosystem reserves.

## EXTINCTIONS

*Slow the very high extinction rates that are leading to a global loss of biodiversity.* Viable approaches include assigning economic valuation to the ways natural ecosystems contribute to human well-being and managing all ecosystems, both in human-dominated regions and in regions far from direct human influence, to sustain and enhance biodiversity and ecosystem services. It will be critical to develop cross-jurisdictional cooperation to recognize and mitigate the interactions of global pressures (for example, climate change, ocean acidification) and local pressures (land transformation, overfishing, poaching endangered species, etc.).

## ECOSYSTEM TRANSFORMATION

*Minimize transformation of Earth's remaining natural ecosystems into farms, suburbs, and other human constructs.* Viable agricultural approaches include increasing efficiency in existing food-producing areas; improving food-distribution systems; and decreasing waste. Viable development approaches include enhancing urban landscapes to accommodate growth rather than encouraging suburban sprawl; siting infrastructure to minimize impacts on natural ecosystems; and investing in vital 'green infrastructure,' such as through restoring wetlands, oyster reefs, and forests to secure water quality, flood control, and boost access to recreational benefits.

## POLLUTION

*Curb the manufacture and release of toxic substances into the environment.* Viable approaches include using current science about the molecular mechanisms of toxicity and applying the precautionary principle (verification of no harmful effects) to guide regulation of existing chemicals and design of new ones. We have the knowledge and ability to develop a new generation of materials that are inherently far safer than what is available today.

## POPULATION GROWTH AND CONSUMPTION

*Bring world population growth to an end as early as possible and begin a gradual decline.* An achievable target is no more than 8.5 billion people by 2050 and a peak population size of no more than 9 billion, which through natural demographic processes can decrease to less than 7 billion by 2100. Viable approaches include ensuring that everyone has access to education, economic opportunities, and health care, including family planning services, with a special focus on women's rights.

*Decrease per-capita resource use, particularly in developed countries.* Viable approaches include improving efficiency in production, acquisition, trade, and use of goods and promoting environmentally-friendly changes in consumer behavior.

Overall, we urge the use of the best science available to anticipate most-likely, worst-case, and best-case scenarios for 50 years into the future, in order to emplace policies that guide for environmental health over the long-term as well as adapting to immediate crises.

## PURPOSE OF THIS CONSENSUS STATEMENT

Since about 1950, the world has been changing faster, and to a greater extent, than it has in the past 12,000 years. Balancing the positive changes against the negative ones will be the key challenge of the 21<sup>st</sup> century.

Positive change has included the Green Revolution, which reduced world hunger (although 1 in 8 people still do not have enough to eat); new medical breakthroughs that have reduced infant and childhood mortality and allow people to live longer and more productive lives; access to myriad goods and services that increase wealth and comfort levels; and new technological breakthroughs, such as computers, cell phones, and the internet, that now connect billions of people throughout the world into a potential global brain.

In contrast, other changes, all interacting with each other, are leading humanity in dangerous directions: **climate disruption, extinction of biodiversity, wholesale loss of vast ecosystems, pollution, and ever-increasing numbers of people** competing for the planet's resources. Until now, these have often been viewed as "necessary evils" for progress, or collateral damage that, while unfortunate, would not ultimately stand in the way of serving the needs of people.

Several recent comprehensive reports by the scientific community, however, have now shown otherwise. Rather than simply being inconveniences, the accelerating trends of climate disruption, extinction, ecosystem loss, pollution, and human population growth in fact are threatening the life-support systems upon which we all depend for continuing the high quality of life that many people already enjoy and to which many others aspire.

The vast majority of scientists who study the interactions between people and the rest of the biosphere agree on a key conclusion: that the five interconnected dangerous trends listed above are having detrimental effects, and if continued, the already-apparent negative impacts on human quality of life will become much worse within a few decades. The multitude of sound scientific evidence to substantiate this has been summarized in many recent position papers and consensus statements (a few samples are listed on pp. 25-26), and documented in thousands of articles in the peer-reviewed scientific literature. However, the position papers and consensus statements typically focus only on a subset of the five key issues (for example, climate change, or biodiversity loss, or pollution), and access to the peer-reviewed literature is often difficult for non-scientists. As a result, policy makers faced with making critical decisions can find it cumbersome both to locate the pertinent information and to digest the thousands of pages through which it is distributed.

Here we provide a summary intended to:

Be useful to policy makers and others who need to understand the most serious environmental-health issues that affect both local constituencies and the entire planet.

Clearly voice the consensus of most scientists who study these issues that:

**Climate disruption, extinction, ecosystem loss, pollution, and population growth** are serious threats to humanity's well-being and societal stability; and

These five major threats do not operate independently of each other.

We also outline broad-brush actions that, from a scientific perspective, will be required to mitigate the threats. The intent is to provide information that will be necessary and useful if the desire of the general public, governments, and businesses is to maximize the chance that the world of our children and grandchildren will be at least as good as the one in which we live now.

## BACKGROUND INFORMATION: DANGEROUS TRENDS IN OUR LIFE SUPPORT SYSTEMS

People have basic needs for food, water, health, and a place to live, and additionally have to produce energy and other products from natural resources to maintain standards of living that each culture considers adequate. Fulfilling all of these needs for all people is not possible in the absence of a healthy, well-functioning global ecosystem. The “global ecosystem” is basically the complex ways that all life forms on Earth — including us — interact with each other and with their physical environment (water, soil, air, and so on). The total of all those myriad interactions compose the planet’s, and our, life support systems.

Humans have been an integral part of the global ecosystem since we first evolved; now we have become the dominant species in it. As such, we strongly influence how Earth’s life support systems work, in both positive and negative ways. A key challenge in the coming decades is to ensure that the negative influences do not outweigh the positive ones, which would make the world a worse place to live. Robust scientific evidence confirms that five interconnected negative trends of major concern have emerged over the past several decades:

**Disrupting the climate** that we and other species depend upon.

**Triggering a mass extinction** of biodiversity.

**Destroying diverse ecosystems** in ways that damage our basic life support systems.

**Polluting our land, water, and air** with harmful contaminants that undermine basic biological processes, impose severe health costs, and undermine our ability to deal with other problems.

**Increasing human population** rapidly while relying on old patterns of production and consumption.

These five trends interact with and exacerbate each other, such that the total impact becomes worse than the simple sum of their parts.

Ensuring a future for our children and grandchildren that is at least as desirable as the life we live now will require accepting that we have already inadvertently pushed the global ecosystem in dangerous directions, and that we have the knowledge and power to steer it back on course — if we act now. Waiting longer will only make it harder, if not impossible, to be successful, and will inflict substantial, escalating costs in both monetary terms and human suffering.

The following pages summarize the causes of each of the five dangerous trends, why their continuation will harm humanity, how they interact to magnify undesirable impacts, and broad-brush solutions necessary to move the human race toward a sustainable, enjoyable future.

## RIISING TO THE CHALLENGE

Defusing the five global crises summarized on the following pages will not be easy, but past experience demonstrates that problems of this huge scale are indeed solvable — if humanity is ready to rise to the challenge. Solutions will require the same things that worked successfully in dealing with past global crises: individual initiative, cooperation both within and across national boundaries, technological advances, and emplacing new infrastructure. Individual initiative has seldom been in short supply and continues to be a powerful human resource. Successful global-through-local cooperation resulted in ending World War II and rebuilding afterwards; banning use of nuclear weapons; dramatically increasing global food production with the Green Revolution and averting food crises through United Nations initiatives; greatly reducing the use of persistent toxic chemicals like DDT; reversing stratospheric ozone depletion (the “ozone hole”); and diminishing infectious diseases such as malaria and polio worldwide.

Likewise, past technological advances and the building of new infrastructure have been remarkable and commensurate in scale with what is needed to fix today’s problems. For instance, in just seven years, responding to demands of World War II, the United States built its airplane fleet from about 3100 to 300,000 planes, and beginning in the 1950s, took less than 50 years to build 47,000 miles (75,639 km) of interstate highways — enough paved roads to encircle Earth almost twice. Over about the same time, 60% of the world’s largest rivers were re-plumbed with dams. In about 30 years, the world went from typewriters and postage stamps to hand-held computers and the internet, now linking a third of the world’s population. During the same time we leapfrogged from about 310 million dial-up, landline phones to 6 *billion* mobile phones networked by satellites and presently connecting an estimated 3.2 billion people.

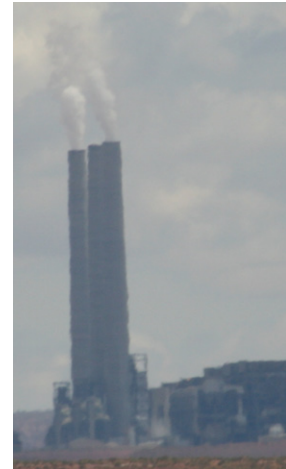
In the context of such past successes, the current problems of climate disruption, extinction, ecosystem loss, pollution, and growing human population and consumption are not too big to solve in the coming 30 to 50 years. Indeed, the scientific, technological, and entrepreneurial pieces are in place, and encouraging initiatives and agreements have begun to emerge at international, national, state, and local levels. Moreover, today’s global connectivity is unprecedented in the history of the world, offering the new opportunity for most of the human population to learn of global problems and to help coordinate solutions.

Three key lessons emerge from the examples given above. The first is that global-scale problems must be acknowledged before they can be solved. The second is that fixing them is imminently possible through ‘win-win’ interactions between local communities, where solutions are actually developed and always emplaced, and higher levels of government, which define priorities backed by clear incentives. The third very important lesson is that big problems cannot be fixed overnight. Given inherent lag times in changing climate, building infrastructure, changing societal norms, and slowing population growth, actions taken today will only begin to bear full fruit in a few decades. If, for example, we move most of the way towards a carbon-neutral energy system by 2035, climate still will not stabilize before 2100, and it will still be a different climate than we are used to now. But, if we delay action to 2035, not only will climate disruption continue to worsen, but efforts at mitigation and adaptation will cost dramatically more; climate would not stabilize until well after the year 2100, and when it did, it would be at an average climate state that is far more disruptive to society than would have been the case if we had acted earlier. Similar costs of delay accrue for the other problems as well; indeed, delaying action on those problems will lead to irretrievable losses of species, ecosystems, and human health and prosperity. Starting *today* to diffuse the global crises we now face is therefore crucial.



# CLIMATE DISRUPTION

It is now clear that people are changing Earth's climate by adding greenhouse gases to the atmosphere primarily through the burning of coal, oil (and its by-products like gasoline, diesel, etc.), and natural gas<sup>1</sup>. The overall trend, still continuing, has been to raise the average temperature of the planet over the course of the last century, and especially the last 60 years. Raising average global temperature causes local changes in temperature, in amount and timing of rainfall and snowfall, in length and character of seasons, and in the frequency of extreme storms, floods, droughts, and wildfires<sup>1,2</sup>. Sea-level rise is a particular concern in coastal areas<sup>1,4</sup>. Such impacts directly influence the wellbeing of people through damaging their livelihoods, property, and health, and indirectly through increasing potentials for societal conflict. Recent examples include the flooding from superstorm Sandy on the east coast of the United States, record wildfires and drought throughout the western United States and Australia, heat waves and drought in Europe, and floods in Pakistan, all of which occurred in 2012 and 2013.



The main greenhouse gases emitted by human activities are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (NO). Of these, CO<sub>2</sub> is particularly important because of its abundance. Human-produced ozone-forming chemicals also are contributing to climate change.

## CAUSES FOR CONCERN

Even best-case emissions scenarios (the IPCC B1 scenario)<sup>1</sup> project that Earth will be hotter than the human species has ever seen by the year 2070, possibly sooner<sup>1,5</sup>. Continuing current emission trends<sup>6</sup> would, by the time today's children grow up and have grandchildren (the year 2100), likely<sup>a</sup> cause average global temperature to rise between 4.3-11.5°F (2.4-6.4°C), with the best estimate being 7.2°F (4°C)<sup>1</sup>. The last time average global temperature was 7.2°F hotter was some 14 million years ago. The last time it was 11.5°F hotter was about 38 million years ago<sup>7</sup>.

Impacts that would be detrimental to humanity by 2100, if not before, should greenhouse gas emissions continue at their present pace, include the following<sup>2,8-10</sup>.

**Longer and more intense heat waves.** The 1-in-20 year hottest day is likely<sup>a</sup> to become a 1-in-2 year event<sup>b</sup> by the end of the 21st century in most regions<sup>2</sup>. Such effects already are being observed — in 2013, temperatures in Australia rose so much that weather maps had to add two new colors to express the new hot extremes. Some models indicate that the current trajectory of warming, if continued to the year 2100, would cause some areas where people now live to be too hot for humans to survive<sup>11</sup>.

<sup>a</sup> The term “likely” in this context implies that there is a 66-100% chance of the effect occurring. Usage here follows definitions explained in IPCC publications. See reference 1 and 2.

<sup>b</sup> For the IPCC A1B and A2 emissions scenarios, see reference 2.



**More frequent damaging storms.** The 1-in-20 year annual maximum daily precipitation amount is likely<sup>a</sup> to become a 1-in-5 to 1-in-15 year event by the end of the 21<sup>st</sup> century in many regions<sup>c</sup>. Cyclone wind speeds are likely<sup>a</sup> to increase. Cities would experience the extent of damage caused by superstorm Sandy on a more frequent basis.

**Major damage to coastal cities as sea level rises.** The extent of sea-level rise will depend in part on how fast glaciers melt. Low-end projections<sup>1</sup> call for a rise in sea level of 0.6-1.9 feet (0.18 to 0.59 meter) by 2100; high-end projections suggest seas rising as high as 2.6-13.1 feet (0.8-4.0 meters)<sup>3,4,9</sup>. Raising sea level to even the lower estimates would flood large parts of major cities worldwide and force the permanent resettlement of millions of people; about 100 million people now live less than 3.3 feet (1 meter) above mean sea level<sup>12</sup>.

**Water shortages in populous parts of the world.** Cities and farmlands that rely on the seasonal accumulation of snow pack and slow spring melt, arid regions that apportion water from major rivers, and regions that depend on water from glacier melt all are at risk<sup>12</sup>.

**Local reduction of crop yields.** New climate patterns will change which crops can be grown in which areas. Some regions are projected to experience overall declines: for instance, cereal crop production is expected to fall in areas that now have the highest population density and/or the most undernourished people, notably most of Africa and India<sup>12</sup>. Key crop-growing areas, such as California, which provides half of the fruits, nuts, and vegetables for the United States, will experience uneven effects across crops, requiring farmers to adapt rapidly to changing what they plant<sup>13,14</sup>.

**Economic losses, social strife and political unrest.** Damage to coastal areas, flooding of ports, water shortages, adverse weather and shifts in crop-growing areas, creation of new shipping lanes, and competition for newly accessible arctic resources all will complicate national and international relations, and cost billions of dollars<sup>9,10,14,15</sup>. For instance, the New York Times reported<sup>d</sup> that by the first months of 2013, United States taxpayers had already paid \$7 billion to subsidize farmers for crops that failed because of extreme drought, and that figure is anticipated to rise as high as \$16 billion.

**Spread of infectious disease.** As temperate regions warm, costly and debilitating mosquito-borne diseases such as malaria are expected to increase in both developed and developing nations<sup>16</sup>. Indeed, expansion of West Nile virus into the United States beginning in 1999 has already occurred, and bluetongue virus, a costly livestock disease carried by midges, has expanded northward into central and northern Europe in the past decade. Besides human suffering, the human-health costs caused by climate change are anticipated to be \$2-4 billion per year by 2030<sup>16</sup>.

**Pest expansions that cause severe ecological and economic losses.** For example, over the past two decades, millions of acres of western North American forests have been killed by pine beetles whose populations have exploded as a result of warmer winter temperatures — previously, extreme winter cold prevented abundant beetle survival<sup>17</sup>. The beetle kill reduces wood production and sales, and lowers property values in developed areas.

**Major damage to unique ecosystems.** Warming and acidification of ocean water is expected to destroy a large portion of the world's coral reefs, essentially the “rainforests of the sea”, so-called because they host most of the oceans' biodiversity<sup>9,18</sup>. On land, forests worldwide face drought-induced decline, both in dry and wet regions<sup>19</sup>. This is especially problematic in many tropical and subtropical forests<sup>20</sup>, which are the cradles of most terrestrial biodiversity.

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<sup>c</sup> For the IPCC B1, A1B, and A2 emissions scenarios, see reference 2.

<sup>d</sup> Ron Nixon, January 15, 2013, Record taxpayer cost is seen for crop insurance, New York Times.

**Extinction of species.** Currently at least 20-40% of assessed species — amounting to a minimum of 12,000-24,000 species — are possibly at increased risk of extinction if mean global temperature increases 2.7-4.5°F (1.5-2.5°C)<sup>1,12</sup>. Current emissions trends are on track for a 7.2°F (4°C) rise in global mean temperature by 2100, which would put many more species at risk<sup>9</sup>. The situation with population extinctions is much worse, with much higher extinction rates in the basic unit of biodiversity that supplies ecosystem services<sup>21</sup>.

## SOLUTIONS

Avoiding the worst impacts of human-caused climate change will require reducing emissions of greenhouse gases substantially<sup>6,9</sup> and quickly<sup>22</sup>. For instance, in order to stabilize atmospheric concentrations of CO<sub>2</sub> at 450 parts per million by the year 2050, which would give a 50% chance of holding global temperature rise to 2°C, emissions would have to be decreased 5.1% per year for the next 38 years. This rate of reduction has not been achieved in any year in the past six decades, which puts the magnitude and urgency of the task in perspective<sup>6</sup>.

However, reducing emissions to requisite values over the next 50 years appears possible through coordinated innovation and deployment of new transportation and energy systems, which can be accomplished largely with existing technology<sup>23-26</sup>. This will require rapid scaling-up of carbon-neutral energy production (solar, wind, hydro, geothermal, hydrogen fuel-cells, nuclear, microbe-based biofuels) to replace energy production from fossil fuels. In the transitional decades when fossil fuels will continue to be in widespread use, increased efficiency in energy use (better gas mileage for cars and trucks, more energy-efficient buildings, etc.) will be necessary, as will phasing out coal-fired power plants in favor of lower-emissions facilities (natural gas). While fossil fuels remain in use during the transitional period, carbon capture and storage (CCS) from major emitters like cement and steel plants will probably be necessary. Scaling up carbon-neutral energy production fast enough will likely require legislation and government policies designed to stimulate the right kinds of innovations and realign the economic landscape for energy production<sup>24,27</sup>.

Some effects of climate change already are underway (sea level rise, higher frequency of extreme weather, etc.). Plans to adapt to unavoidable climate changes will need to be developed and implemented for cities and public lands. Keeping agricultural areas productive will require changing the crops grown in some places, and ensuring seed stocks that are adapted to new climates. Ultimate monetary costs for climate mitigation and adaptation grow substantially each year action is postponed<sup>13,22</sup>.

“The world needs another industrial revolution in which our sources of energy are affordable, accessible and sustainable. Energy efficiency and conservation, as well as decarbonizing our energy sources, are essential to this revolution.”

S. Chu and A. Majumdar, 2012, ref. 24

# EXTINCTIONS

**B**iological extinctions cannot be reversed and therefore are a particularly destructive kind of global change. Even the most conservative analyses indicate that human-caused extinction of other species is now proceeding at rates that are 3-80 times faster than the extinction rate that prevailed before people were abundant on Earth<sup>28</sup>, and other estimates are much higher<sup>29-32</sup>. If the current rate of extinction is not slowed for species and their constituent populations, then within as little as three centuries the world would see the loss of 75% of vertebrate species (mammals, birds, reptiles, amphibians, and fish), as well as loss of many species of other kinds of animals and plants<sup>28</sup>. Earth has not seen that magnitude of extinction since an asteroid hit the planet 65 million years ago, killing the dinosaurs and many other species. Only five times in the 540 million years since complex life forms dominated Earth have mass extinctions occurred at the scale of what current extinction rates would produce; those mass extinctions killed an estimated 75%-96% of the species known to be living at the time.

Currently, sound scientific criteria document that at least 23,000 species are threatened with extinction, including 22% of mammal species, 14% of birds, 29% of evaluated reptiles, as many as 43% of amphibians, 29% of evaluated fish, 26% of evaluated invertebrate animals, and 23% of plants<sup>33-35</sup>. Populations—groups of interacting individuals that are the building blocks of species—are dying off at an even faster rate than species. The extinction of local populations, in fact, represents the strongest pulse of contemporary biological extinction. For example, since 1970 some 30% of all vertebrate populations have died out<sup>36</sup>, and most species have experienced loss of connectivity between populations because of human-caused habitat fragmentation. Healthy species are composed of many, interconnected populations; rapid population loss, and loss of connectivity between populations, are thus early warning signs of eventual species extinction.

## CAUSES FOR CONCERN

The world's plants, animals, fungi, and microbes are the working parts of Earth's life-support systems. Losing them imposes direct economic losses, lessens the effectiveness of nature to serve our needs ("ecosystem services," see next page), and carries significant emotional and moral costs.

**Economic losses.** At least 40% of the world's economy and 80% of the needs of the poor are derived from biological resources<sup>12</sup>. In the United States, for example, commercial fisheries, some of which rely on species in which the majority of populations have already gone extinct, provide approximately one million jobs and \$32 billion in income annually<sup>37</sup>. Internationally, ecotourism, driven largely by the opportunity to view currently threatened species like elephants, lions, and cheetahs, supplies 14% of Kenya's GDP (in 2013)<sup>38</sup> and 13% of Tanzania's (in 2001)<sup>39</sup>, and in the Galapagos Islands, ecotourism contributed 68% of the 78% growth in GDP that took place from 1999-2005<sup>40</sup>. Local economies in the United States also rely on revenues generated by ecotourism linked to wildlife resources: for example, in the year 2010 visitors to Yellowstone National Park, which attracts a substantial number of tourists lured by the prospect of seeing wolves and grizzly bears, generated \$334 million and created more than 4,800 jobs for the surrounding communities<sup>41</sup>. In 2009, visitors to Yosemite National Park created 4,597 jobs in the area, and generated \$408 million in sales revenues, \$130 million in labor income, and \$226 million in value added<sup>42</sup>.

**Loss of basic services in many communities.** Around the world, indigenous and rural communities depend on the populations of more than 25,000 species for food, medicine, and shelter<sup>43</sup>.

**Loss of ecosystem services.** Extinctions irreversibly decrease biodiversity, which in turn directly costs society through loss of ecosystem services<sup>44-46</sup>. “Ecosystem services” (see the box) are attributes of ecological systems that serve people. Among the ecosystem services that support human life and endeavors are: moderating weather; regulating the water cycle, stabilizing water supplies; filtering drinking water; protecting agricultural soils and replenishing their nutrients; disposing of wastes; pollinating crops and wild plants; providing food from wild species (especially seafood); stabilizing fisheries; providing medicines and pharmaceuticals; controlling spread of pathogens; and helping to reduce greenhouse gases in the atmosphere<sup>34,45</sup>. In contrast to such directly quantifiable benefits promoted by high biodiversity, reducing biodiversity generally reduces the productivity of ecosystems, reduces their stability, and makes them prone to rapidly changing in ways that are clearly detrimental to humanity<sup>45</sup>. For example, among other costs, the loss of tropical biodiversity from deforestation often changes local or regional climate, leading to more frequent floods and droughts and declining productivity of local agricultural systems. Tropical deforestation can also cause new diseases to emerge in humans, because people more often encounter and disrupt animal vectors of disease<sup>47,48</sup>.

**Intangible values.** Continuing extinction at the present pace would considerably degrade quality of life for hundreds of millions of people who find emotional and aesthetic value in the presence of iconic species in natural habitats. In this context species are priceless, in the sense of being infinitely valuable. An apt metaphor is a Rembrandt or other unique work of art that evokes exceptional human feelings, and whose loss would be generally recognized as making humanity poorer.

The world's ecosystems are *Natural Capital* that provides vital benefits called *Ecosystem Services* necessary for:

Production of goods (crops, timber, seafood)

Life-support systems (provision and purification of water, buffering against storms, floods, and droughts)

Life-fulfilling amenities (beauty, opportunity for recreation, and the associated physical and mental health benefits)

Options (genetic diversity for future use in agriculture, energy, pharmaceuticals and other industries)

Modified from G. Daily et al., 2000, ref. 46

## CHIEF DRIVERS OF EXTINCTION

The main drivers of human-caused extinction<sup>28,30-32,35,49</sup> are:

**Habitat destruction from ecosystem transformation.** Such practices as unsustainable forestry and conversion of land to agriculture, suburban sprawl, and roads, all cause both habitat destruction and habitat fragmentation. In particular, logging and clearing of tropical rainforests for ranching or farming permanently destroys the habitats for vast numbers of species. Such areas are among the most important reservoirs of terrestrial biodiversity, harboring thousands of unique

species and plant and animal functional groups (ecological niches) found nowhere else<sup>43</sup>. In the oceans, habitat destruction and fragmentation results from pollution, trawling, shipping traffic, and shipping noise (sonar, etc.).

**Environmental contamination.** Environmental contamination from human-made chemicals contributes to extinction pressures by destroying habitats (for instance, mine dumps, oil spills and agricultural runoff), by direct toxic effects of pollutants, and through subtle effects on animals' immune and reproductive systems.

**Climate change.** Extinctions result when species cannot move fast enough to find climatic refuges as the climate becomes unsuitable where they now live; when climate changes such that it exceeds their physiological, developmental, or evolutionary tolerances; or when critical species interactions (the way one species depends on the next) are disrupted<sup>50</sup>. On land, models predict that by the year 2100, between 12% and 39% of the planet will have developed climates that no living species has ever experienced, and conversely, the climate that many species currently live in will disappear from 10% to 48% of Earth's surface<sup>51</sup>. These changes will be most pronounced in areas that currently harbor most of the world's biodiversity. In the oceans, acidification, a by-product of climate change that disrupts growth and development of marine organisms, is of particular concern, because it prevents marine shelly animals such as clams and oysters from building their shell, and causes collapse of the physical reef infrastructure on which most marine species ultimately depend.

**Intensive exploitation of wild species for profit.** Some iconic species, such as elephants, rhinoceroses, and tigers are being hunted to extinction to sell their tusks, horns, or other body parts to be made into curios or for purported health products. For example, the demand for ivory from elephant tusks, primarily from Asian markets, has driven the price high enough that elephant poaching has now become a lucrative source of income for international crime rings and terrorist organizations. Other species are being over-utilized as marketable food—this is especially a problem for many ocean fisheries, such as those for Bluefin tuna and Atlantic cod. Demand is outstripping supply for such species—there are now seven times as many humans on the planet as there are wild salmon<sup>54</sup>. In the same vein, the dramatic and rapid clearing of rainforests is motivated by immediate economic profit. In all of these cases, the one-time gain in profit (which benefits relatively few people) is a pittance compared to the loss of natural capital, which supplies important benefits locally and globally for the long term. In economic terms, it is analogous to spending down the principal of an investment rather than living off the interest.

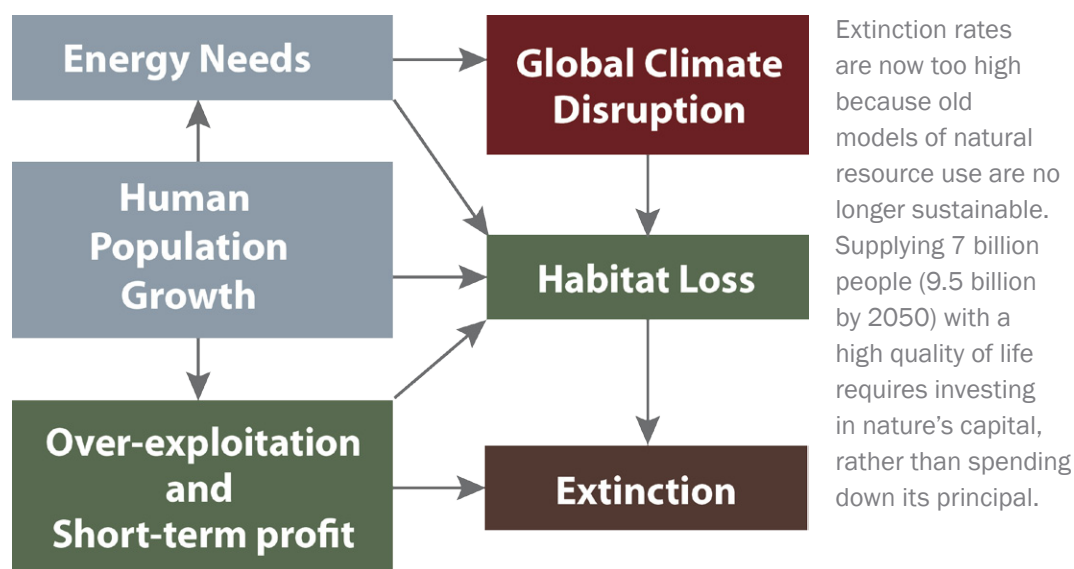


If current rates of elephant poaching continue, there would be no more wild elephants\* on Earth within 20-30 years. The bulk of the short-term profits go to organized crime and terrorist groups. In contrast, revenues from ecotourism are sustainable for the long run and contribute directly to local economies.

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\* This assumes continuation of the annual rate of about 25,000 elephants killed in 2011, and a world population of between 420,000-650,000 African elephants<sup>52</sup> plus about 50,000 Asian elephants<sup>53</sup>.





### SOLUTIONS

Because species losses accrue from global pressures, and species and ecosystem distributions transcend political boundaries, solutions to the extinction crisis require coordination between local actions, national laws, and international agreements, as well as strict enforcement of policies<sup>35,55</sup>. Such a multi-jurisdictional approach is essential to prevent illegal trafficking in wildlife products; enhance protection of species in public reserves; and develop effective policies to ensure sustainable fisheries<sup>35</sup>. Management plans for individual species, as well as for public lands and marine protected areas, will need to include adaptation to climate change<sup>5,9,28,35,56</sup>. Assessment of species risks will need to be accelerated<sup>33</sup>, particularly for invertebrate species<sup>34</sup> and fish.

In addition, it will be necessary to address the root causes of climate change and unnecessary ecosystem transformation (see those sections of this consensus statement, pp. 4 and 11). An important part of the solution will be economic valuation of natural capital and ecosystem services, such that global, regional, and local economies account for the benefits of banking natural capital for the long run, rather than irretrievably depleting finite species resources for short-term economic gain<sup>44,57</sup>. Workable examples already exist in China, where 120 million farmers are being paid to farm in ways that not only yield crops and timber but also stabilize steep slopes, control floods, and maintain biodiversity<sup>44</sup>; in Costa Rica<sup>46</sup>, where a national payment system for ecosystem services has helped to change deforestation rates from among the highest in the world to among the lowest; and in New York City, where maintaining natural landscapes for water filtration is more economical than building filtration plants<sup>57</sup>.

“Many actions in support of biodiversity have had significant and measurable results in particular areas and amongst targeted species and ecosystems. This suggests that with adequate resources and political will, the tools exist for loss of biodiversity to be reduced at wider scales.”

Global Biodiversity Outlook 3, ref. 35

# ECOSYSTEM TRANSFORMATION



Almost half of Earth's ice-free land has already been changed completely by human activities. Nowhere on the land or in the sea is completely free of human influence.

As humans have become more abundant, we have transformed large parts of the Earth's surface from their pre-human “natural” state into entirely different landscapes and seascapes<sup>58</sup>. Some of these transformations have been necessary to support basic human needs; others have been inadvertent and unanticipated.

As of 2012, somewhat more than 41% of Earth's ice-free lands (36% of total land surface) have been commandeered for farms, ranches, logging, cities, suburbs, roads, and other human constructs<sup>59-61</sup>. This equates to an average of a little less than 2 acres of transformed land for each person on Earth. Conversion for agriculture accounts for most of the landscape change, with crops covering about 12% and pastureland about 26% of ice-free land (the percentages are about 10% and 22%, respectively, for the proportion of all Earth's land). Urban lands account for another 3%. On top of that are vast road networks that fragment habitats across some 50% of the entire land surface, dams that modify water flow in more than 60% of the world's large rivers and in many smaller ones<sup>62</sup>, and continuing deforestation that has been proceeding at the rate of about 30,000 square kilometers (=11,000 square miles) per year for the past 16 years<sup>63</sup>. This per-year loss is roughly the equivalent of clear-cutting the entire country of Belgium or in the United States, the states of Massachusetts or Hawaii in one year.

Measuring the percentage of the oceans that have been transformed is much more challenging, but it is clear that pollution, trawling, and ship traffic and noise have caused major changes along most of the world's coastlines<sup>64,65</sup>. For example, bottom trawling alone has been estimated to annually destroy an area of seabed equivalent to twice the area of the continental United States<sup>66</sup>. Human debris, particularly plastics, also is ubiquitous in ocean waters, even far offshore<sup>67</sup>.



The human footprint extends even outside of the ecosystems that have been transformed wholesale by people. Nearly every terrestrial ecosystem in the world now integrates at least a few species that ultimately were introduced by human activities<sup>68-70</sup>, sometimes with devastating losses in ecosystem services<sup>71</sup>, and invasive species now number in the hundreds in most major marine ports<sup>72,73</sup> and in the thousands on most continents<sup>70,74,75</sup>. All told, 83% of the entire land surface exhibits human impact defined as influenced by at least one of the following factors: human population density greater than 1 person per square kilometer (=1 person per 0.4 square miles, or 247 acres); agricultural activity; built-up areas or settlements; being within 15 kilometers (9.3 miles) of a road or coastline; or nighttime light bright enough to be detected by satellites<sup>76,77</sup>. Adding in the effect of climate change, every place on Earth exhibits at least some human impact, even the most remote parts of the land and oceans<sup>78</sup>.

## CAUSES FOR CONCERN

There are two conflicting concerns with respect to ecosystem transformation.

**The need to minimize the human footprint to prevent extinction of other species and degradation of essential ecosystem services.** Ecological “tipping points,” where whole ecosystems change suddenly and unexpectedly to become less biodiverse and in many cases less productive<sup>79</sup>, are known to be triggered by transforming threshold percentages of their areas. Many studies document that when 50% to 90% of patches within a landscape are disturbed, the remaining undisturbed patches undergo rapid, irreversible changes as well<sup>5,80-83</sup>. Therefore, wholesale ecological transformation of more than half of Earth’s ecosystems by direct human impacts is prone to trigger unanticipated, irreversible degradation even in ecosystems that are not directly utilized by humans. Such changes already are becoming evident in nitrogen deposition in remote arctic lakes<sup>84</sup>, by dwindling populations of once-common species in some nature reserves<sup>85</sup>, by millions of acres of beetle-killed forests<sup>17</sup>, and by invasive species such as zebra mussels<sup>70,71</sup>.

“Cities, regions, or countries that are not able to provide a high quality of life on a low [Ecological] Footprint will be at a disadvantage in a resource-constrained future.”

B. Ewing et al., 2010, ref. 77

**The need to feed, house, and provide acceptably high standards of living** for the seven billion people that are now on the planet plus 2.5 billion more that probably will be added over the next three decades<sup>86,87</sup> means that the demands for land use will accelerate (see p. 16, the Population Growth section, for more details on this). Nearly 70% of the arable land that has not yet been converted to agricultural use is in tropical grasslands and forests, which include some of the world’s most important biodiversity reservoirs and so far are among the lands least impacted by humans<sup>66</sup>. Farming less arable lands would take even more acres per person than at present, because of lower productivity per acre<sup>88</sup>.

## SOLUTIONS

Because food production is the chief transformer of natural ecosystems, a key challenge will be feeding more people without significantly adding to the existing agricultural and fisheries footprint. Valuing natural capital (as explained earlier in the Extinctions section, p. 7) is a promising approach that can lead to significant gains in both biodiversity and crop yields; for instance, as has been shown by integrating coffee farms with natural landscapes in Costa Rica<sup>89</sup>. Slowing and ultimately stopping the encroachment of agriculture into currently uncultivated areas (especially the few remaining tropical rainforests and savannahs) will probably require regulatory policies and incentives for conservation. Recent studies indicate that even without increasing the agricultural footprint, it is feasible to increase food production adequately in an environmentally sound way through<sup>60,90</sup>: (a) improving yields in the world's currently less productive farmlands; (b) more efficiently using the water, energy, and fertilizer necessary to increase yields; (c) eating less meat; and (d) reducing food waste through better infrastructure, distribution, and more efficient consumption patterns—some 30% of the food currently produced is discarded or spoiled. Adapting crop strains to changing climate will also be required to maximize yields<sup>91,92</sup>. In the oceans, solutions lie in enhanced fisheries management; sustainable aquaculture that focuses on species for which farming does not consume more protein than is produced; and reduction of pollution, especially along coasts<sup>93,94</sup>.

It will be necessary to avoid losing more land to suburban sprawl through emphasizing development plans that provide higher-density housing and more efficient infrastructure in existing built-up areas, rather than carving new communities wholesale out of less disturbed surrounding lands.

Climate change will affect all places on the planet—those that are currently little impacted by humanity, as well as those now intensively used for agriculture or cities and towns—and the effects will be more pronounced with greater amounts of warming. Avoiding global ecosystem transformation will therefore also require keeping climate change to a minimum.

# POLLUTION



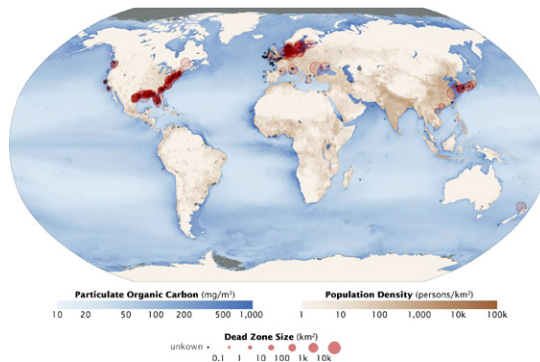
The brown haze of air pollution is pernicious in and around many cities, and causes some six million deaths each year. Pictured is the smog accumulating south of San Francisco, California, on a cool winter day.

There are few, if any places on Earth where human-produced environmental contaminants are not being deposited. Traces of pesticides and industrial pollutants are routinely found in samples of soil or tree bark from virtually any forest in the world, in the blubber of whales, in polar bear body tissues, in fish from most rivers and oceans, and in the umbilical cords of newborn babies<sup>66,95</sup>. Smog in many cities is far above levels considered safe<sup>96</sup>. In the worst cases — such as in Beijing during January 2013 — polluted air can be seen from space. Other air pollutants, such as greenhouse gases and ozone, are invisible but cause serious global-scale problems, notably climate disruption. Oil spills routinely contaminate oceans and coastlines, as well as inland waters and land areas. Nuclear waste, and especially radioactive contamination from accidents at nuclear plants, is a growing problem, as is the ubiquity of hormone-disrupting or cancer-causing chemicals such as bisphenol-A (commonly known as BPA)<sup>97</sup>. Activities such as mining, manufacturing, and recycling of electronic equipment have not only concentrated dangerous pollutants locally, but also distributed them worldwide, notably harmful substances such as lead, chromium, mercury, and asbestos<sup>98,99</sup>.

## CAUSES FOR CONCERN

**Health impacts.** The health costs of pollution are enormous. At least 125 million people are now at direct risk from toxic wastes produced by mining and manufacturing<sup>98</sup>. As of 2010 air pollution caused up to 6 million premature deaths per year<sup>96,100</sup>. Environmental exposures are thought to contribute to 19% of cancer incidence worldwide<sup>98</sup>. Millions of people drink groundwater contaminated with cancer-causing arsenic or harmful microbes<sup>101</sup>. All total, as of 2010, the number of years lost due to illness, disability or early death (disability-adjusted life years, or DALYS) from environmental hazards is probably greater than those lost to malaria, tuberculosis, and HIV/AIDS combined<sup>100</sup>. An emerging concern is the effect of hormone-simulating chemicals, such as endocrine disruptors, which may be affecting human growth, development, and health on a large scale. For instance, endocrine disruptors have been linked to earlier onset of puberty and obesity<sup>97</sup>. The latter also leads to increased incidence of heart disease and type II diabetes<sup>102</sup>.

**Dead zones.** Excess nitrogen from farm fertilizers, sewage plants, livestock pens, and coal plants eventually ends up in waterways and makes its way to the oceans, where it stimulates prodigious algal growth. Decay of the dead algae then sucks all the oxygen out of the water<sup>66,95</sup>. The result is a dead zone where marine life is greatly reduced. Most coasts of the world now exhibit elevated nitrogen flow, with large dead zones occurring near major population centers<sup>103,104</sup>.



World distribution of dead zones in the ocean caused primarily by nitrogen pollution. Figure from NASA, ref.104.

**Environmental devastation.** Greenhouse gas pollutants—primarily human-produced carbon dioxide (CO<sub>2</sub>), nitrous oxide (NO), and methane (CH<sub>4</sub>) — are the causes of one of the biggest environmental problems, climate disruption<sup>1</sup>. Herbicides, pesticides, and various chemicals used in plastic production contaminate many waterways directly, and then are taken up by organisms and bioamplified through food chains. Virtually all human beings on Earth carry a burden of these persistent chemicals, many of which are endocrine disruptors. Pharmaceuticals meant for humans or livestock, and subsequently flushed into drains or otherwise finding their way into rivers and lakes, disrupt growth and development of amphibians and fish. Sewage and excess fertilizer contribute significantly to damaging more than half of the world's coral reefs, and in some ecoregions, up to 90% of reefs<sup>66,95</sup>.

## SOLUTIONS

The pollution problem is not a new one. The sources of environmental contamination generally are well known, especially for the worst sources, such as lead-battery recycling, lead smelting, mining and ore processing, tannery operations, municipal and industrial dumpsites, product manufacturing, chemical manufacturing, petrochemical industry, electronic waste, agricultural pesticides and excess fertilizers, and greenhouse gases<sup>66,95,98</sup>. Viable prevention and cleanup solutions are available for most pollutants, but are often not employed because of cost. Significant reductions in pollution from manufacturing can be found in better regulation and oversight of industries using and producing hazardous wastes; better industry practices in controlling hazardous wastes and substances; educating local communities and hazardous industries in adverse effects of pollutants; enhancement of technology for management and treatment of pollutants; and minimizing location of potentially hazardous industries near population centers. Reducing air pollution (including greenhouse gases) requires phasing out coal-fired power plants and high-emissions vehicles immediately, and over time replacing fossil-fuel sources of energy with clean energy. Minimizing agricultural pollution requires maximizing efficiency in application of fertilizers, pesticides, and antibiotics.

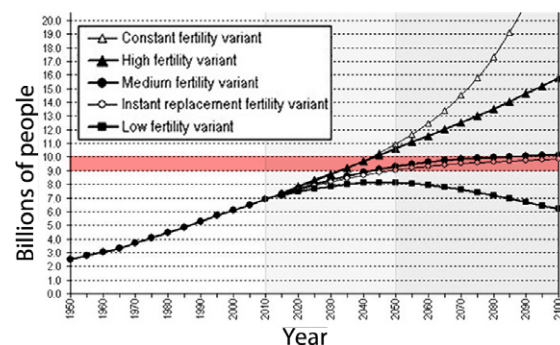
Even more promising than these traditional approaches is to use our current scientific understanding of the mechanisms of toxicity to guide synthetic chemistry toward a new generation of inherently safer materials. This is now imminently feasible, and it promises to reward entrepreneurs who adopt these green chemistry approaches in the market<sup>105</sup>.

# POPULATION GROWTH AND RESOURCE CONSUMPTION

There are two aspects to the population problem. One is how many people are on Earth. The other is the wide disparity in the 'ecological footprint' among different countries and societal sectors, with a relatively small proportion of humanity inefficiently using and impacting an inordinately large proportion of ecological resources.

Today there are more than seven billion people on the planet. Demographic projections of population growth indicate that some 2.5 billion more people may be added to the world population by 2050<sup>86,87</sup>, when today's children will be reaching middle age (see the population growth chart below). How population actually changes in coming decades depends largely on what happens to fertility rates (the average number of children borne per woman in the population in her lifetime), as well as mortality rates. If the global average fertility rate stayed at its present level, there could be 27 billion people on Earth in the year 2100, but that is extremely unlikely. If fertility changed worldwide to "replacement rate" (in which parents just "replaced" themselves in the next generation — about 2.1 children per woman) and mortality rates were those typical of developed countries, then there would be 10.1 billion people in 2100. With a global average fertility rate of  $\frac{1}{2}$  child above replacement rate, the population would reach 15.8 billion in 2100, and a rate of  $\frac{1}{2}$  child below replacement would lead to an early peak in population size and a decline to about 6.2 billion people by 2100.

There are very wide differences in fertility between countries today. At the low end, rates are just 1.2 or 1.3 in several developed countries, including Latvia, Portugal, South Korea, and Singapore. Some countries with slightly higher fertility rates now show declining rates, including Russia, Germany, and Japan. Virtually all developed countries and a number of developing countries, including China, Brazil, and Thailand, now have below-replacement fertility, and their populations are on track to stop growing within a few decades at most. By contrast, many very poor developing countries still have fertility rates as high as 6 or more children per family: e.g., Zambia, Somalia, Burundi, and Afghanistan, among others. It is the high fertility in these regions that may keep the world population growing for a century more unless population policies lower their fertility sooner rather than later.



If the fertility rate in all countries rapidly changes so each family on average has one daughter, population will crest by 2050, then stabilize around 10.1 billion. The red line marks a population of 9-10.1 billion. Chart from UNDESA, 2011, ref. 87.

## CAUSES FOR CONCERN

Each of the seven billion people now on Earth contributes at some level to climate disruption, extinctions, ecosystem transformation, and pollution. The actual contributions of course vary from region to region, country to country, and between rich and poor (see the graph on p. 17), with the general pattern being a much larger per capita footprint in highly industrialized, wealthier countries, and a lower per capita footprint in developing, poorer countries. Although each individual contribution to the global-change footprint can be tiny, when multiplied by billions, the effect becomes inordinately



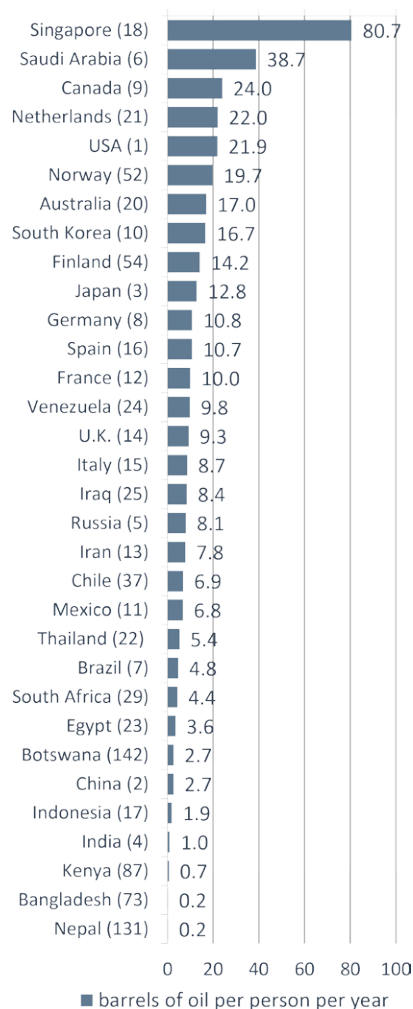
large. Among the key ways population growth contributes to world problems are the following.

**Climate disruption.** On average each person on Earth produces about 4.9 tonnes of CO<sub>2</sub> per year, as of 2011<sup>106</sup>; thus, as population grows, greenhouse gases and consequent climate disruption increase proportionately.

**Extinctions.** Direct causes of extinction (habitat destruction, overexploitation) can be expected to increase as billions more people occupy and use more and more of the planet<sup>66</sup>. Further extinctions are likely to result from climate change. In addition, there are serious indirect impacts, notably the amount of net primary productivity, or NPP<sup>e</sup>, that humans consume or co-opt. (NPP is a measure of the “natural energy” available to power the global ecosystem.) Humans now appropriate about 28% of all NPP (although estimates range from 23% to 40%)<sup>58,61,107-109</sup>. There are limits to the amount of NPP that can be produced on Earth, so the more NPP that humans use, the less is available for other species. That means that as the human population grows, populations of other species inevitably go extinct (unless special conservation measures mitigate the losses) because of global energy constraints. Calculations that assume no change in human consumption patterns indicate that the amount of NPP required by 20 billion people—which would occur by the year 2085 if fertility rates stayed the same as they are now—would cause the extinction of most other species on Earth<sup>110</sup>. Clearly, a human population of that size is untenable.

**Ecosystem Transformation.** A little less than 2 acres of land has already been converted for each person on Earth<sup>5,58,60</sup>. If that per capita rate of land conversion continued, adding 2.5 billion more people to the planet means that the majority of Earth’s lands — a little over 50% — would have been changed into farms, pastures, cities, towns, and roads by 2050. Continuing to use land at the rate of 2 acres per person would mean that 85% of Earth’s lands would have to be used — including inhospitable places like deserts, the Arctic, and the Antarctic — if the population hit 15 billion. Such unworkable scenarios underscore that population cannot grow substantially without reducing the human footprint.

**Pollution.** All of the most dangerous sources of pollution result from per capita demand for goods and services and, given current practices, will increase proportionately with the number of people on Earth. Additionally, there is the problem of treating and disposing of human waste (sewage and garbage), which multiplies roughly in proportion to numbers of people.



Consumption varies dramatically among countries, as illustrated by this graph of average barrels of oil used per person per year in some of the top oil-consuming countries compared to other representative nations. Numbers in parentheses give world rank in oil consumption. Numbers at right are barrels used per person per year (data from CIA Fact Book, 2013, ref. 115). The challenge is bringing down per capita consumption rates in countries in which rates are now too high, while allowing for growth in developing countries that are now at low consumption rates. In the case of fossil fuels, scaling up of renewables and new technological innovations will be required to solve the problem.

<sup>e</sup> NPP is defined as the net amount of solar energy converted to plant organic matter through photosynthesis.

An important consideration is that basic needs—a place to live, food, water, and adequate health care—are difficult to provide even for the seven billion people already alive today. Although international programs have been making significant gains in bringing these basic needs to more people and places, about 80% of the world's population still lives below poverty level (i.e., on less than \$10 per day; 1.4 billion people still live on less than \$1.25 per day)<sup>111</sup>; 2.6 billion people lack basic sanitation services (more than one-third of all the people on the planet)<sup>111</sup>; 1.1 billion people have inadequate access to water<sup>111</sup>; about 870 million people (1 out of every 8) lack enough food<sup>112</sup>; and 1 billion people lack access to basic health care systems<sup>113</sup>. Addition of 2.5 billion more people by 2050, and more after that, would make these already-challenging problems even more difficult to solve, particularly since the highest fertility rates currently are in the poorest countries. For example, despite an overall decrease in malnourished children from 1990 to 2011, the number of underfed children in Africa—where populations have grown substantially and most countries are relatively poor—rose from about 46 million to 56 million in those two decades<sup>114</sup>.



Access to basic needs like food, water, and health care is difficult or lacking for billions of people, even today.

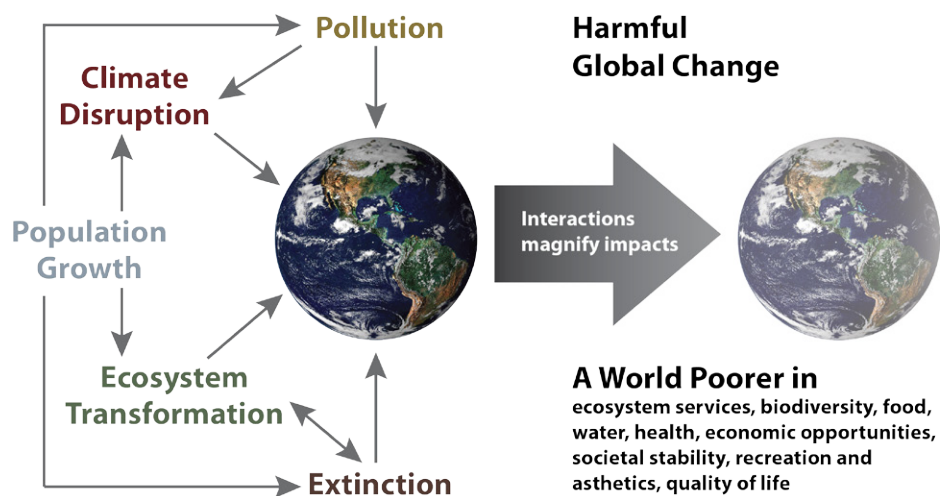
## SOLUTIONS

Two strategies will be required to avoid the worst impacts of population growth. The first involves recognizing that sustaining at least the quality of life that exists today while still adding some billions of people will require reducing the per capita human footprint—for example, developing and implementing carbon-neutral energy technologies, producing food and goods more efficiently, consuming less, and wasting less. This amounts to a dual challenge of reducing the per capita use of resources in economically developed countries, while still allowing growth in quality of life in developing countries. For example, the average U.S. citizen used about 22 barrels of oil per year in 2011, whereas the average person in China and India used only about 3 and 1 barrels, respectively (see the graph on p. 17)<sup>115</sup>. Evening out such disparities while still preserving quality of life will require a transformation of energy and resource-consumption regimes in both rich and poor nations, as well as major technological breakthroughs in some areas. Especially in the energy sector, policy changes will be needed to ensure that developing countries can “leap-frog” over outdated technologies, as occurred with the mobile phone industry. Overall, per capita consumption can be reduced by using state-of-the-art science for designing, developing, and commercializing the materials that are used by billions of people.

The second strategy involves ensuring that the lower population-growth projections are the ones that prevail<sup>44,116</sup>. The medium-fertility variant worldwide (on average one daughter per family) would stabilize world population at about 10 billion; that would actually entail a large increase in fertility in all developed countries plus China and dozens of other developing countries. Therefore the 10-billion benchmark clearly can be improved upon. Today, about 40% of the population lives in countries where fertility is already near replacement, and another 42% lives in countries where the fertility rate is significantly lower. The “low” projection (see the graph on p. 16) is achievable and should be the goal. Ending world population growth at about 8 billion requires bringing down fertility rates in the 18% of the population<sup>87</sup> that live mostly in economically disadvantaged countries, where people still lack ready access to education and health care. Raising levels of education, particularly among women, and providing access to safe and effective means of contraception to those who want it, have been proven to reduce fertility rates substantially<sup>44,117</sup>.



# INTERACTIONS



The interactions between climate disruption, population growth and consumption, ecosystem transformation, pollution, and extinction greatly magnify the potential for undesirable global change.

While climate disruption, extinctions, ecosystem transformation, pollution, and population growth all are serious problems on their own, they interact with each other in ways that make their total effects much more than simply the sum of their parts. For example, pollution leads to local losses of biodiversity, which in turn leads to major ecological changes. Cutting down old-growth rainforests permanently transforms local climate by making it effectively drier, which in turn permanently changes the local ecosystem from forest to grassland. At the same time global climate disruption is magnified as a result of removing a major source of carbon sequestration. Scaling up, as global climate reaches critical thresholds of change, rapid disappearance of whole biomes, such as boreal forests<sup>118</sup>, may result. Some pressures are tied intimately to others: for instance, increasing human population size, and especially increasing per capita consumption, multiplies the impacts of all four of the other problems.

## CAUSES FOR CONCERN

Interaction effects markedly increase the chances that crossing critical thresholds will lead to irreversible change<sup>79,119</sup>. That means that multiple global pressures can combine to cause undesirable changes to occur more unexpectedly, faster and more intensely than what would be predicted from considering each pressure separately<sup>120-124</sup>. Such unanticipated changes in essential resources — food, water, climate predictability, biodiversity — are likely to result in social strife.

The pressures of each dangerous trend on its own, combined with the multiplying effect of combining them, makes it highly plausible that disruptive societal changes would occur within decades if business as usual continues<sup>5,120,122</sup>. Even taken individually, the current trajectories of climate change, extinctions, ecosystem transformation, pollution, and population growth are faster and greater than the planetary pressures that triggered so-called ‘planetary state-changes’ in the past<sup>5</sup>. Essentially, those were times when the Earth system hit a “tipping point,” that is, suddenly switched to a new condition that precipitated abrupt, major, and permanent changes, including losses of species and shifts in ecological structure and ecosystem services that affected all places on the planet. The last time this happened was nearly 12,000 years ago, when the last glaciation ended. In general, “tipping points” are characteristic of how biological systems respond to continued pressures, and they are well documented at a variety of spatial and temporal scales<sup>79,125</sup>.

## SOLUTIONS

Minimizing the chances that unanticipated global changes will result from interaction effects requires flattening the trajectories of all five dangerous trends<sup>126</sup>. An important part of the solution lies in relieving the global pressures that have the strongest interaction effects, namely population growth, per capita resource consumption, and greenhouse gas emissions. These affect conditions in all parts of the planet, because the extent of ecosystem transformation, extinctions, and pollution inevitably multiply as population grows, as people consume more, and as climate changes, and climate disruption becomes more pronounced as more people use energy derived from fossil fuels.

While the science is clear that continuing the negative trends of climate disruption, extinction, ecosystem loss, pollution, population growth and growing per capita consumption are harmful to humanity, actually solving these problems will require recognition of their urgency by people and governments at all levels. The technological expertise is available to mitigate many of the harmful impacts, but ultimately, science and technology only provide the tools; it is up to society to decide whether or not they want to use them. Therefore, a crucial next step in diffusing these problems is societal recognition of their urgency and willingness to commit human ingenuity and resources towards implementing solutions<sup>88</sup>. This will entail enhanced education about these issues at all levels, including schools, businesses, the media, and governments, and sustainable development goals that acknowledge that human well-being depends on planetary well-being<sup>126</sup>.

**The window of time for this global effort to begin is short, because the science also demonstrates that with each passing year of business as usual, the problems not only become worse, they become more expensive and difficult to solve, and our chances of avoiding the worst outcomes diminish. Put another way, starting now means we have a good chance of success; delaying even a decade may be too late.**

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DATE: May 5, 2013

NAME: Ameka, Gabriel  
POSITION: Professor of Botany  
INSTITUTION: Department of Botany, University of Ghana, Legon, Ghana  
DATE: 20/05/2013

NAME: Barbara J. Anderson  
POSITION: Research Fellow  
INSTITUTION: University of Otago  
DATE: 20th May 2013

NAME: Nigel Andrew  
POSITION: Associate Professor of Entomology  
INSTITUTION: University of New England, Armidale, Australia  
DATE: 3<sup>rd</sup> May 2013

NAME: Arto Annala  
POSITION: Professor, Department of Physics  
INSTITUTION: University of Helsinki  
DATE: May 20, 2013

NAME: Miguel Bastos Araújo  
POSITION: Senior Research Scientist  
INSTITUTION: National Museum of Natural Sciences, Madrid, Spanish Research Council (CSIC)  
DATE: 25/04/2012

NAME: W. Scott Armbruster  
POSITION: Professor of Ecology & Evolution  
INSTITUTION: University of Portsmouth, UK, and University of Alaska, Fairbanks  
DATE: 7 May 2013

NAME: Kenneth J. Arrow  
POSITION: Professor Emeritus of Management Science and Engineering  
INSTITUTION: Stanford University  
DATE: Monday, 20 May 2013

NAME: Beatriz Arroyo  
POSITION: Researcher  
INSTITUTION: Instituto de Investigación en Recursos Cinegéticos (IREC)  
DATE: 7/05/2013

NAME: Dr. Mary T. K. Arroyo  
POSITION: Director and Full Professor of Biology  
INSTITUTION: Institute of Ecology and Biodiversity (IEB)  
DATE: 30 April, 2013

NAME: JOAQUIN ARROYO-CABRALES  
POSITION: SENIOR SCIENTIST  
INSTITUTION: INSTITUTO NACIONAL DE ANTROPOLOGIA E HISTORIA, MEXICO  
DATE: 10 MAY 2013

NAME: Khalid Aziz

POSITION: Otto N Miller Professor Emeritus, Energy Resources Engineering  
INSTITUTION: Stanford University  
DATE: May 20, 2013

### B

NAME: Doris Bachtrog  
POSITION: Associate Professor  
INSTITUTION: UC Berkeley  
DATE: April 29, 2013

NAME: Prof. Dr. Franz Bairlein  
POSITION: Director  
INSTITUTION: Institute of Avian Research, Wilhelmshaven, Germany  
DATE: 18 May 2013

NAME: Lela Bakanidze, Ph.D., RBP  
POSITION: Professor, Nonproliferation Programs Manager  
INSTITUTION: Agricultural University of Georgia, Tbilisi  
DATE: 17 May 2013

NAME: Bruce G. Baldwin  
POSITION: Professor of Integrative Biology & Curator of the Jepson Herbarium  
INSTITUTION: University of California, Berkeley  
DATE: 29 April 2013

NAME: Roger C Bales  
POSITION: Director, Sierra Nevada Research Institute & Professor, School of Engineering  
INSTITUTION: University of California, Merced  
DATE: Apr 28, 2013

NAME: Patricia Balvanera  
POSITION: Researcher in Ecology  
INSTITUTION: Universidad Nacional Autónoma de México  
DATE: April 25 2013

NAME: Edward B. Barbier  
POSITION: John S. Bugas Professor of Economics, Department of Economics & Finance  
INSTITUTION: University of Wyoming  
DATE: April 25, 2013

NAME: Anthony D. Barnosky  
POSITION: Professor and Curator, Department of Integrative Biology and Museum of Paleontology  
INSTITUTION: University of California-Berkeley  
DATE: April 23, 2013

NAME: K. Christopher Beard  
POSITION: Director, Center for Evolutionary Studies  
INSTITUTION: Carnegie Museum of Natural History, Pittsburgh, PA 15213  
DATE: May 1, 2013

NAME: Andrew J. Beattie  
POSITION: Emeritus Professor  
INSTITUTION: Macquarie University, Sydney  
DATE: 29 April 2013

NAME: Paul Beier  
POSITION: President, Society for Conservation Biology  
REGENTS' Professor  
INSTITUTION: School of Forestry, Northern Arizona University, Flagstaff AZ  
DATE: April 25, 2013

NAME: Elena Bennett  
POSITION: Associate Professor  
INSTITUTION: McGill University  
DATE: 25 April 2013

NAME: Sally Benson  
POSITION: Director, Global Climate and Energy Project  
INSTITUTION: Department of Energy Resources Engineering, Stanford University  
DATE: March 7, 2013

NAME: Prof Tim Benton  
POSITION: Professor of Population Ecology  
INSTITUTION: University of Leeds, UK  
DATE: April 25, 2013

NAME: Dennis Berg  
POSITION: Professor Emeritus  
INSTITUTION: California State University, Fullerton  
DATE: May 3, 2013

NAME: Eric L Berlow  
POSITION: Founder / Adjunct Professor  
INSTITUTION: Vibrant Data Labs / University of California Berkeley  
DATE: 27 April 2013

NAME: BERTHEAU Yves (PhD, HDR)  
POSITION: Directeur de recherche (senior scientist)  
INSTITUTION: Inra (Institut national de la recherche agronomique), France  
DATE: 2013/05/08

NAME: Robert L. Beschta, PhD  
POSITION: Professor Emeritus  
INSTITUTION: Forest Ecosystems and Society, Oregon State University  
DATE: April 30, 2013

NAME: Martijn Bezemer  
POSITION: Senior Scientist  
INSTITUTION: Netherlands Institute of Ecology, NIOO-KNAW  
DATE: 6 May 2013

NAME: David Blair  
POSITION: Adjunct Professor  
INSTITUTION: James Cook University  
DATE: 20 May 2013

NAME: Jessica L. Blois  
POSITION: Assistant Professor  
INSTITUTION: University of California, Merced  
DATE: 26 April 2013

NAME: Daniel T. Blumstein  
POSITION: Professor & Chair, Department of Ecology & Evolutionary Biology and Institute of the Environment & Sustainability  
INSTITUTION: University of California Los Angeles  
DATE: April 25, 2013

NAME: Carol Boggs  
POSITION: Consulting Professor  
INSTITUTION: Stanford  
DATE: 5/19/2013

NAME: Prof. Katrin Böhning-Gaese  
POSITION: Acting Director Biodiversity and Climate Research Centre Frankfurt  
INSTITUTION: Biodiversity and Climate Research Centre Frankfurt  
DATE: 17.05.2013

NAME: Dr Walter Boles  
POSITION: Senior Fellow  
INSTITUTION: Australian Museum, Sydney  
DATE: 10 May 2013

NAME: Timothy C. Bonebrake  
POSITION: Assistant Professor  
INSTITUTION: University of Hong Kong  
DATE: May 1 2013

NAME: Erik Bonsdorff  
POSITION: Professor  
INSTITUTION: Department of biosciences, Åbo Akademi University, Finland  
DATE: May 15, 2013

NAME: Jeffrey L. Boore  
POSITION: Adjunct Professor  
INSTITUTION: University of California Berkeley; and  
POSITION: Chief Executive Officer  
INSTITUTION: Genome Project Solutions, Inc.  
DATE: May 2, 2013

NAME: David J Booth  
POSITION: Professor of Marine Ecology  
INSTITUTION: University of Technology, Sydney  
DATE: 26 April 2013

NAME: Derek Booth  
POSITION: Adjunct Professor, Bren School of Environmental Science & Management, UC Santa Barbara  
Affiliate Professor, Earth and Space Sciences, Univ. of Washington  
Senior Editor, Quaternary Research  
INSTITUTION: UC Santa Barbara and University of Washington  
DATE: May 13, 2013

NAME: Enrique Bostelmann Torrealba  
POSITION: Associate Researcher  
INSTITUTION: 1) Laboratorio de Ontogenia y Filogenia, Departamento de Biología, Facultad de Ciencias, Universidad de Chile, Santiago, Chile, and 2) Paleontology section, Museo nacional de Historia Natural, Montevideo, Uruguay.  
DATE: MAY 10, 2013

NAME: Yanis Bouchenak-Khelladi  
POSITION: Researcher  
INSTITUTION: Institute of Systematic Botany, University of Zurich  
DATE: Tuesday 30th of April 2013

NAME: Dr. Mark E. Braun  
POSITION: Professor of Social Sciences  
INSTITUTION: SUNY-Cobleskill  
DATE: May 2, 2013

NAME: David D. Breshears  
POSITION: Professor  
INSTITUTION: The University of Arizona  
DATE: May 13, 2013

NAME: Michael Briguglio  
POSITION: Lecturer  
INSTITUTION: University of Malta  
DATE: April 27, 2013

NAME: Thomas Brooks  
POSITION: Head, Science & Knowledge  
INSTITUTION: International Union for Conservation of Nature  
DATE: 28 Apr 2013

NAME: James H. Brown  
POSITION: Professor, Department of Biology,  
INSTITUTION: University of New Mexico  
DATE: April 23, 2013

NAME: Yvonne Buckley  
POSITION: Associate Professor  
INSTITUTION: The University of Queensland  
DATE: 29/4/13

NAME: April Bullock  
POSITION: Professor of Liberal Studies  
INSTITUTION: Cal State Fullerton  
DATE: May 2, 2013

NAME: Nils Bunnfeld  
POSITION: Lecturer  
INSTITUTION: University of Stirling, UK  
DATE: 16 May 2013

NAME: Santiago F. Burneo  
POSITION: Curator. Mammal Collection. Museo de Zoología.  
INSTITUTION: Pontificia Universidad Católica del Ecuador  
DATE: April 25, 2013

NAME: Robyn J. Burnham  
POSITION: Associate Professor of Ecology & Evolutionary Biology  
INSTITUTION: University of Michigan  
DATE: April 24, 2013

NAME: Bruno Alves Buzatto  
POSITION: Postdoctoral Research Associate  
INSTITUTION: University of Western Australia  
DATE: 25/4/2013

## C

NAME: Juan Rivero de Aguilar Cachafeiro  
POSITION: Biologist  
INSTITUTION: MNCN-CSIC  
DATE: 25.4.13

NAME: Lawrence B. Cahoon  
POSITION: Professor of Biology and Marine Biology  
INSTITUTION: UNC Wilmington  
DATE: 4/26/13

NAME: John Cairns  
POSITION: University Distinguished Professor of Environmental Biology Emeritus  
INSTITUTION: Virginia Polytechnic Institute and State University  
DATE: April 28, 2013

NAME: Margaret Caldwell  
POSITION: Senior Lecturer & Director, Environmental and Natural Resources Law & Policy Program  
INSTITUTION: Stanford Law School  
DATE: 5/19/13

NAME: José M. Capriles  
POSITION: Visiting Scholar, Center for Comparative Archaeology, Department of Anthropology  
INSTITUTION: University of Pittsburgh  
DATE: May 12th, 2013

NAME: Stephen R. Carpenter  
POSITION: Professor and Director  
INSTITUTION: Center for Limnology, University of Wisconsin-Madison  
DATE: 25 April 2013

NAME: Aurora M Castilla  
POSITION: Principal Investigator; Head Department of Biodiversity  
INSTITUTION: Qatar Environment & Energy Research Institute  
DATE: 13 May 2013

NAME: Juan Carlos Castilla  
POSITION: Profesor Titular  
INSTITUTION: Pontificia Universidad Católica de Chile  
DATE: 21 May 2013

NAME: GERARDO CEBALLOS  
POSITION: PROFESSOR.  
INSTITUTION: INSITUTO DE ECOLOGIA, UNAM  
DATE: APRIL 25, 2013

NAME: C. Page Chamberlain  
 POSITION: Professor  
 INSTITUTION: Dept. Environmental Earth System  
 Science, Stanford University  
 DATE: May 2, 2013

NAME: Laurie Hing Man Chan  
 POSITION: Professor and Canada Research Chair in  
 Toxicology and Environmental Health; Director,  
 Center for Advanced Research in Environmental  
 Genomics  
 INSTITUTION: University of Ottawa  
 DATE: April 29, 2013

NAME: Yvonne Chan  
 POSITION: Postdoctoral Researcher  
 INSTITUTION: University of Hawaii  
 DATE: April 25, 2013

NAME: F. Stuart Chapin, III  
 POSITION: Professor Emeritus  
 INSTITUTION: University of Alaska Fairbanks  
 DATE: May 19, 2013

NAME: Chemin-Roberty Anne  
 POSITION: Chargée de Coordination et  
 Communication  
 INSTITUTION: Institut Michel Serres, Ecole normale  
 supérieure de Lyon  
 DATE: 30/04/2013

NAME: Deliang Chen  
 POSITION: August Röhss Chair  
 INSTITUTION: Department of Earth Sciences,  
 University of Gothenburg, Sweden  
 DATE: 28 April, 2013

NAME: Anne CHENUIL  
 POSITION: Ph.D. Researcher  
 INSTITUTION: UMR 7263 (CNRS) – IMBE, Institut  
 Méditerranéen de Biodiversité et d'Ecologie  
 Marine et continentale (IMBE) (Aix-Marseille  
 Université)  
 DATE: 30 April 2013

NAME: Norman L. Christensen  
 POSITION: Research Professor and Founding Dean  
 INSTITUTION: Nicholas School of the Environment,  
 Duke University, Durham, NC 27708  
 DATE: May 7, 2013

NAME: Patrick Christie  
 POSITION: Professor, School of Marine and  
 Environmental Affairs and Jackson School of  
 International Studies  
 INSTITUTION: University of Washington  
 DATE: April 26th, 2013

NAME: James S Clark  
 POSITION: Professor  
 INSTITUTION: Duke University  
 DATE: Apr 25 2013

NAME: William A. Clemens  
 POSITION: Curator and Professor Emeritus,  
 University of California Museum of Paleontology  
 and Department of Integrative Biology  
 INSTITUTION: University of California Berkeley  
 DATE: May 1, 2013

NAME: Phyllis D. Coley  
 POSITION: Distinguished Professor of Biology  
 INSTITUTION: University of Utah  
 DATE: April 26, 2013

NAME: Scott L Collins  
 POSITION: Regent's Professor  
 INSTITUTION: University of New Mexico  
 DATE: 4/25/2013

NAME: Patricia Ann Conrad  
 POSITION: Professor, Department of  
 Pathology, Microbiology and Immunology, School  
 of Veterinary Medicine  
 INSTITUTION: University of California, Davis  
 DATE: April 25, 2013

NAME: Caroline S. Conzelman, Ph.D.  
 POSITION: Associate Director, Global Studies  
 Academic Program; Program Director, Bolivia  
 Global Seminar  
 Instructor, Anthropology  
 INSTITUTION: University of Colorado at Boulder  
 DATE: 28 April 2013

NAME: Jorge Cortés  
 POSITION: Researcher and Professor of Marine  
 Sciences  
 INSTITUTION: Universidad de Costa Rica  
 DATE: 21 May 2013

NAME: Tim Coulson  
 POSITION: Professor of Zoology  
 INSTITUTION: University of Oxford  
 DATE: 7 May 2013

NAME: Denis Couvet  
 POSITION: Professor  
 INSTITUTION: Muséum National Histoire Naturelle,  
 Paris  
 DATE: 26 April 2013

NAME: Pete Coxon  
 POSITION: Professor of Geography  
 INSTITUTION: Trinity College Dublin  
 DATE: 20/05/2013

NAME: Craig Criddle  
 POSITION: Professor, Department of Civil &  
 Environmental Engineering, and Senior Fellow,  
 Woods Institute  
 INSTITUTION: Stanford University  
 DATE: 18 May 2013

NAME: JORGE V. CRISCI  
 POSITION: PROFESSOR OF BIOGEOGRAPHY  
 INSTITUTION: UNIVERSIDAD NACIONAL DE LA  
 PLATA, ARGENTINA  
 DATE: MAY 19, 2013

NAME: Larry Crowder  
 POSITION: Ed Ricketts Professor of Biology and  
 Science Director for the Center for Ocean  
 Solutions  
 INSTITUTION: Stanford University Hopkins Marine  
 Station  
 DATE: May 16, 2013

NAME: Lisa M. Curran  
 POSITION: Professor  
 INSTITUTION: Stanford University  
 DATE: 20 May 2013

NAME: CURY, PHILIPPE  
 POSITION: Senior Scientist and Director of UM  
 EME 212  
 INSTITUTION: IRD  
 DATE: 10 May 2013

## D

NAME: Gretchen C. Daily  
 POSITION: Professor  
 INSTITUTION: Department of Biology and Senior  
 Fellow, Woods Institute, Stanford University  
 DATE: April 23, 2013

NAME: Edward Davis  
 POSITION: Fossil Collections Manager  
 INSTITUTION: University of Oregon Museum of  
 Natural and Cultural History  
 DATE: 04/25/2013

NAME: Frank W. Davis  
 POSITION: Professor, Bren School of Environmental  
 Science and Management  
 INSTITUTION: University of California, Santa  
 Barbara  
 DATE: May 6, 2013

NAME: Michael N Dawson  
 POSITION: Associate Professor  
 INSTITUTION: School of Natural  
 Sciences, University of California, Merced  
 DATE: 27 April 2013

NAME: Todd E. Dawson  
 POSITION: University of California - Berkeley  
 INSTITUTION: Departments of Integrative Biology  
 -and- Environmental Science, Policy &  
 Management  
 DATE: 25 April 2013

NAME: Giulio De Leo  
 POSITION: Professor  
 INSTITUTION: Department of Biology and Senior  
 Fellow, Woods Institute for the Environment,  
 Stanford University  
 DATE: May 18 2013

NAME: Sebsebe Demissew, Prof.  
 POSITION: Professor of Systematic Botany and  
 Angiosperm Phylogeny, Leader of the Ethiopian  
 Flora Project (completed in 2009)  
 INSTITUTION: Department of Plant Biology and  
 Biodiversity Management, College of Natural  
 Sciences, Addis Ababa University, Addis Ababa,  
 Ethiopia  
 DATE: 17 May 2013

NAME: Jared Diamond  
 POSITION: Professor  
 INSTITUTION: University of California Los Angeles  
 DATE: May 19, 2013

NAME: Mario Díaz  
 POSITION: Senior Researcher  
 INSTITUTION: Dep. Biogeography and Global  
 Change (BGC-MNCN), Museo Nacional de  
 Ciencias Naturales, CSIC, Spain  
 DATE: 26-4-2013

NAME: Sandra Diaz  
 POSITION: Full Professor and Senior Principal  
 Investigator  
 INSTITUTION: Instituto Multidisciplinario de Biología  
 Vegetal, CONICET  
 and Universidad Nacional de Córdoba, Argentina.  
 DATE: 20 May 2013

NAME: Christopher R. Dickman  
 POSITION: Professor in Terrestrial Ecology  
 INSTITUTION: The University of Sydney, Australia  
 DATE: 18 May 2013

NAME: Rodolfo Dirzo,  
 POSITION: Professor, Department of Biology and  
 Director, Center for Latin American Studies  
 INSTITUTION: Stanford University  
 DATE: April 23, 2013

NAME: Diane Dodd  
 POSITION: Assistant Professor  
 INSTITUTION: University of North Carolina  
 Wilmington  
 DATE: 4/25/13

NAME: C. Josh Donlan MA PhD  
 POSITION: Director, Advanced Conservation  
 Strategies; Visiting Professor, Laboratoire  
 Ecologie, Systématique & Evolution,  
 Université Paris-Sud 11; Fellow, Cornell University  
 INSTITUTION: Université Paris-Sud 11; Cornell  
 University  
 DATE: April 26, 2012

NAME: Michael J. Donoghue  
 POSITION: Sterling Professor of Ecology and  
 Evolutionary Biology  
 INSTITUTION: Yale University  
 DATE: April 25, 2013

NAME: Peter Doran  
 POSITION: Distinguished Professor  
 INSTITUTION: University of Illinois at Chicago  
 DATE: April 25, 2013

NAME: Don Driscoll  
 POSITION: Associate Professor  
 INSTITUTION: Fenner School of Environment and  
 Society, Australian National University  
 DATE: 29/4/13

NAME: Robert Dudley  
 POSITION: Professor  
 INSTITUTION: University of California, Berkeley  
 DATE: 29 April 2013

NAME: Ivo Duijnste  
 POSITION: Assistant Adjunct Professor  
 INSTITUTION: Dep. of Integrative Biology, University  
 of California, Berkeley/University of California  
 Museum of Paleontology / Dep. of Earth  
 Sciences, Utrecht University  
 DATE: April 30, 2013

NAME: John P. Dumbacher  
 POSITION: Associate Curator of Ornithology and  
 Mammalogy  
 INSTITUTION: California Academy of Sciences, San  
 Francisco, CA  
 DATE: 13 May 2013

NAME: Robert B. Dunbar  
 POSITION: W.M. Keck Professor of Earth Sciences  
 INSTITUTION: Stanford University  
 DATE: 4/25/13

## E

NAME: William E. Easterling  
 POSITION: Dean, College of Earth and Mineral  
 Sciences  
 INSTITUTION: The Pennsylvania State University  
 DATE: 1 May 2013

NAME: Alasdair Edwards  
 POSITION: Emeritus Professor of Coral Reef Ecology  
 INSTITUTION: Newcastle University, UK  
 DATE: 17/05/2013

NAME: Bob Edwards  
 POSITION: Professor of Sociology  
 INSTITUTION: East Carolina University  
 DATE: April 26, 2013

NAME: Mary Edwards  
 POSITION: Professor  
 INSTITUTION: University of Southampton,  
 Geography and Environment  
 DATE: 7<sup>th</sup> May 2013

NAME: Emilie EGEA  
 POSITION: Technician staff (PhD)  
 INSTITUTION: Mediterranean Institute for

Biodiversity and Ecology, Centre National de la  
 Recherche Scientifique, France  
 DATE: April 30th 2013

NAME: Anne H. Ehrlich  
 POSITION: Policy Coordinator and Senior Research  
 Assistant  
 INSTITUTION: Center for Conservation Biology,  
 Stanford University  
 DATE: April 23, 2013

NAME: Paul R. Ehrlich  
 POSITION: Professor, Department of Biology and  
 Center for Conservation Biology  
 INSTITUTION: Stanford University  
 DATE: April 23, 2013

NAME: Steven d. Emslie  
 POSITION: Professor  
 INSTITUTION: University of North Carolina  
 Wilmington  
 DATE: 6 MAY 2013

NAME: Professor Matthew England  
 POSITION: ARC Laureate Fellow  
 Climate Change Research Centre (CCRC) and ARC  
 Centre of Excellence for Climate System Science  
 INSTITUTION: The University of New South Wales  
 DATE: 29 April 2013

NAME: Barend Erasmus  
 POSITION: Associate professor and Director: Centre  
 for African Ecology  
 INSTITUTION: University of the Witwatersrand  
 DATE: 9 May 2013

NAME: Jussi T. Eronen  
 POSITION: Postdoctoral Researcher  
 INSTITUTION: Department of Geosciences and  
 Geography, University of Helsinki  
 DATE: April 23, 2013

NAME: Gilles ESCARGUEL  
 POSITION: Associate-Professor  
 INSTITUTION: Dpt. of Earth Sciences, University  
 Lyon 1 (France)  
 DATE: April, 30th, 2013

NAME: James A. Estes  
 POSITION: Professor  
 INSTITUTION: University of California, Santa Cruz  
 DATE: 25 April 2013

## F

NAME: Juan A. Fargallo  
 POSITION: Researcher  
 INSTITUTION: Consejo Superior de Investigaciones  
 Cientificas (CSIC)  
 DATE: 13-05-2013

NAME: Alejandro G. Farji-brener  
 POSITION: Investigador , Profesor  
 INSTITUTION: Conicet-Argentina, Centro Regional  
 Universitario Bariloche, Universidad Nacional  
 del Comahue, Argentina  
 DATE: 20 DE MAYO 2013

NAME: Marcus W. Feldman, MS, PhD  
 POSITION: Burnet C. and Mildred Finley Wohlford  
 Professor of Biological Sciences; Director of the  
 Morrison Institute for Population and Resource  
 Studies and Stanford Health Policy Associate  
 INSTITUTION: Stanford University  
 DATE: May 19, 2013

NAME: Scott Fendorf  
 POSITION: Professor

INSTITUTION: Stanford University  
 DATE: 5/19/2013

NAME: Pablo Ferreras  
 POSITION: Senior Scientist Research, Spanish  
 Research Council (CSIC)  
 INSTITUTION: Spanish Game Research Institute  
 (IREC), Ciudad Real, Spain  
 DATE: May 7<sup>th</sup>, 2013

NAME: Seth Finnegan  
 POSITION: Assistant Professor  
 INSTITUTION: UC Berkeley, Dept. of Integrative  
 Biology  
 DATE: April 28, 2013

NAME: JON FJELDSÅ  
 POSITION: PROFESSOR  
 INSTITUTION: NATURAL HISTORY MUSEUM OF  
 DENMARK, University of Copenhagen, Denmark  
 DATE: 21. May 2013

NAME: Joern Fischer  
 POSITION: Professor  
 INSTITUTION: Leuphana University Lueneburg,  
 Germany  
 DATE: 18 May 2013

NAME: Matthew Forrest  
 POSITION: Post-doctoral researcher  
 INSTITUTION: Biodiversity and Climate Research  
 Centre, Frankfurt am Main, Germany  
 DATE: 16th May 2013

NAME: Mikael Fortelius  
 POSITION: Professor, Department of Geosciences  
 and Geography  
 INSTITUTION: Finnish Museum of Natural History  
 and University of Helsinki  
 DATE: April 23, 2013

NAME: Carolin Frank  
 POSITION: Assistant Professor  
 INSTITUTION: UC Merced  
 DATE: 4/26/13

NAME: Peter Frumhoff  
 POSITION: Director of Science and Policy, Chief  
 Scientist, Climate Campaign  
 INSTITUTION: Union of Concerned Scientists  
 DATE: 30 April 2013

NAME: Tadashi Fukami  
 POSITION: Assistant Professor of Biology  
 INSTITUTION: Stanford University  
 DATE: May 21, 2013

NAME: Dr Richard Fuller  
 POSITION: Senior Lecturer  
 INSTITUTION: University of Queensland  
 DATE: 27<sup>th</sup> April 2013

## G

NAME: Eric Galbraith  
 POSITION: Assistant Professor  
 INSTITUTION: Department of Earth and Planetary  
 Science, McGill University  
 DATE: April 29, 2013

NAME: Candace Galen  
 POSITION: Professor  
 INSTITUTION: University of Missouri  
 DATE: April 26, 2013

NAME: Amiran Gamkrelidze MD, PhD, Professor  
 POSITION: Director General  
 INSTITUTION: National Center for Disease Control



and Public Health, Tbilisi  
DATE: 18 May 2013

NAME: Laura Gangoso  
POSITION: Post doc researcher  
INSTITUTION: Department of Wetland Ecology,  
Estación Biológica de Doñana, CSIC, Spain.  
DATE: 25/04/2013

NAME: Francisco Garcia-Gonzalez  
POSITION: Ramon y Cajal Research Fellow  
INSTITUTION: Donana Biological Station-Spanish  
Research Council, Seville, Spain  
DATE: 25th April 2013

NAME: Christopher Gardner, PhD  
POSITION: Associate Professor of Medicine  
(Research)  
INSTITUTION: Stanford Prevention Research Center,  
Stanford University  
DATE: May 20, 2013

NAME: Stephen Garnett  
POSITION: Professor of Conservation and  
Sustainable Livelihoods  
INSTITUTION: Charles Darwin University  
DATE: 25 April 2013

NAME: Dan Gavin  
POSITION: Associate Professor, Department of  
Geography  
INSTITUTION: University of Oregon  
DATE: May 6, 2013

NAME: Leah Gerber  
POSITION: Associate Professor  
INSTITUTION: School of Life Sciences, Arizona State  
University  
DATE: April 25, 2013

NAME: Anne E. Giblin  
POSITION: Senior Scientist  
INSTITUTION: Marine Biological Laboratory  
DATE: 4/29/2013

NAME: Diego Gil  
POSITION: Senior Scientist  
INSTITUTION: MNCN (CSIC, Spain)  
DATE: 25-4-13

NAME: Michael Gillings  
POSITION: Professor of Molecular Evolution  
INSTITUTION: Biological Sciences, Macquarie  
University, Sydney, Australia  
DATE: 28/04/2013

NAME: Dr. Peter Gleick  
POSITION: Pacific Institute, President  
Member, US National Academy of Sciences  
INSTITUTION: Pacific Institute  
DATE: May 8, 2013

NAME: Deborah M. Gordon  
POSITION: Professor  
INSTITUTION: Stanford University  
DATE: 5-16-13

NAME: Lisa J. Graumlich  
POSITION: Dean, College of the Environment  
Virginia and Prentice Bloedel Professor  
INSTITUTION: University of Washington  
DATE: April 26, 2012

NAME: ANDREW GREEN  
POSITION: RESEARCH PROFESSOR  
INSTITUTION: DOÑANA BIOLOGICAL STATION  
DATE: 30 APRIL 2013

NAME: Charles H. Greene  
POSITION: Professor, Department of Wrath &

Atmospheric Sciences  
INSTITUTION: Cornell University  
DATE: 4/30/13

NAME: Harry W. Greene  
POSITION: Professor of Ecology and Evolutionary  
Biology  
INSTITUTION: Cornell University  
DATE: April 28, 2013

NAME: Dr. Marilyn J Grey  
POSITION: Honorary Research Fellow  
INSTITUTION: Department of Zoology, La Trobe  
University, Melbourne, Australia  
DATE: 20 May 2013

NAME: Marianna Grossman  
POSITION: President and Executive Director  
INSTITUTION: Sustainable Silicon Valley  
DATE: MAY 3, 2013

NAME: Mats Gyllenberg  
POSITION: Professor, Head of Department  
INSTITUTION: Department of Mathematics and  
Statistics, University of Helsinki  
DATE: May 7, 2013

## H

NAME: Elizabeth A. Hadly  
POSITION: Professor, Department of Biology and  
Senior Fellow, Woods Institute  
INSTITUTION: Stanford University  
DATE: April 23, 2013

NAME: Joan Stephens Hadly  
POSITION: Sr Vice President, Advancement  
INSTITUTION: Museum of Science Boston  
DATE: May 8, 2013

NAME: Yohannes Haile-Selassie  
POSITION: Curator  
INSTITUTION: Cleveland Museum of Natural History  
DATE: May 12, 2013

NAME: Sharon J. Hall  
POSITION: Associate Professor  
INSTITUTION: Arizona State University  
DATE: May 18, 2013

NAME: Olivier Hamant  
POSITION: Researcher  
INSTITUTION: INRA, France  
DATE: 26 April 2013

NAME: Philip C. Hanawalt  
POSITION: Morris Herzstein Professor of Biology  
INSTITUTION: Stanford University  
DATE: May 16, 2013

NAME: Catherine HÄNNI  
POSITION: CNRS Director  
INSTITUTION: CNRS/ENS Lyon  
DATE: April 30, 2013

NAME: James Hansen  
POSITION: Director of Hansen Climate Science  
Program  
INSTITUTION: Columbia University Earth Institute  
DATE: 21 May 2013

NAME: Ilkka Hanski  
POSITION: Research professor  
INSTITUTION: University of Helsinki  
DATE: April 25, 2013

NAME: David D. Hart  
POSITION: Director, Senator George J. Mitchell

Center for Sustainability Solutions  
INSTITUTION: University of Maine, Orono  
DATE: 4/30/2013

NAME: John Harte  
POSITION: Professor of Ecosystem Sciences  
INSTITUTION: UC Berkeley  
DATE: April 25, 2013

NAME: Celia A. Harvey  
POSITION: Vice President, Ecosystem Services,  
INSTITUTION: Conservation International  
DATE: May 21, 2013

NAME: PAUL HARVEY CBE FRs  
POSITION: Professor  
INSTITUTION: Department of Zoology, University of  
Oxford, UK  
DATE: 7 May 2013

NAME: Angie Haslem  
POSITION: Research Fellow  
INSTITUTION: La Trobe University  
DATE: 20 May 2013

NAME: AHMED HASSANALI  
POSITION: Professor of Chemistry (Chemical  
Ecology & Bioprospecting)  
INSTITUTION: Kenyatta University, Nairobi, KENYA  
DATE: May 20, 2013

NAME: Alan Hastings  
POSITION: Distinguished Professor  
INSTITUTION: University of California, Davis  
DATE: May 17, 2013

NAME: MARK HAY  
POSITION: PROFESSOR OF BIOLOGY  
INSTITUTION: GEORGIA INSTITUTE OF TECHNOLOGY  
DATE: 4/25/13

NAME: Harold Heatwole  
POSITION: Professor of Biology  
INSTITUTION: North Carolina State University  
DATE: 25 April 2013

NAME: H. Craig Heller  
POSITION: Professor of Biology and Human  
Biology  
INSTITUTION: Stanford University  
DATE: May 16, 2013

NAME: Jessica J. Hellmann  
POSITION: Associate Professor of Biological  
Sciences  
INSTITUTION: University of Notre Dame  
DATE: May 15, 2013

NAME: Martin Hellman  
POSITION: Professor Emeritus of  
Electrical Engineering  
INSTITUTION: Stanford University  
DATE: 26 APRIL 2013

NAME: Hans R Herren  
POSITION: President  
INSTITUTION: Millennium Institute, Washington, DC  
and Biovision Foundation, Zurich  
DATE: May 10, 2013

NAME: Josiah Heyman  
POSITION: Professor of Anthropology and Chair,  
Sociology and Anthropology  
INSTITUTION: University of Texas at El Paso  
DATE: April 29, 2013

NAME: Thomas Hickler  
POSITION: Professor for Quantitative Biogeography  
INSTITUTION: Biodiversity and Climate Research  
Centre (BiK-F), Frankfurt/Main, Germany

DATE: 17.5.2013

NAME: Larry D. Hinzman  
POSITION: Director and Professor  
INSTITUTION: University of Alaska Fairbanks  
DATE: 20 May 2013

NAME: Mark Hixon  
POSITION: Hsiao Endowed Chair of Marine Biology  
INSTITUTION: University of Hawai'i at Manoa  
DATE: 25 April 2013

NAME: Leslea J. Hlusko  
POSITION: Associate Professor Integrative Biology  
INSTITUTION: University of California Berkeley  
DATE: 13 May 2013

NAME: Prof Richard J Hobbs  
POSITION: Australian Laureate Fellow  
School of Plant Biology  
INSTITUTION: The University of Western Australia  
DATE: 20 May 2013

NAME: Dr. Karen E. Hodges  
POSITION: Associate Professor, Conservation  
Biology  
INSTITUTION: University of British Columbia  
Okanagan, Kelowna, BC, Canada  
DATE: 25 April 2013

NAME: Hopi E. Hoekstra  
POSITION: Alexander Agassiz Professor of Zoology  
INSTITUTION: Harvard University  
DATE: April 25, 2013

NAME: Christian Hof  
POSITION: Postdoctoral Researcher  
INSTITUTION: Biodiversity and Climate Research  
Centre (BiK-F) & Senckenberg Gesellschaft für  
Naturforschung, Frankfurt, Germany  
DATE: 17 May 2013

NAME: Andrew J. Hoffman  
POSITION: School of Natural Resources &  
Environment/Ross School of Business  
INSTITUTION: University of Michigan  
DATE: April 25, 2013

NAME: Karen D. Holl  
POSITION: Professor of Environmental Studies  
INSTITUTION: University of California, Santa Cruz  
DATE: 25 April 2013

NAME: C.S.Holling  
POSITION: Emeritus Professor  
INSTITUTION: University of Florida  
DATE: May 20, 2003

NAME: Professor Joseph A M Holtum  
POSITION: Coordinator of Plant Sciences and  
Tropical Agriculture  
INSTITUTION: James Cook University  
DATE: Monday 20th May 2013

NAME: David Hooper  
POSITION: Professor of Biology  
INSTITUTION: Western Washington University,  
Bellingham, WA  
DATE: 5/19/13

NAME: Professor Stephen D. Hopper AC FLS FTSE  
POSITION: Professor of Biodiversity  
INSTITUTION: The University of Western Australia  
DATE: 26<sup>th</sup> April 2013

NAME: Joaquín Hortal  
POSITION: RyC Research Fellow  
INSTITUTION: Museo Nacional de Ciencias  
Naturales (CSIC), Madrid, Spain  
DATE: 13 May 2013

NAME: Øystein Hov  
POSITION: Director of Research and Professor  
INSTITUTION: Norwegian Meteorological Institute  
and University of Oslo  
DATE: 20 May 2013

NAME: Alex Hubbe  
POSITION: Postdoctoral Fellow  
INSTITUTION: Instituto de Biociências, Universidade  
de São Paulo, Brazil  
DATE: 05/09/2013

NAME: Prof. Lesley Hughes  
POSITION: Dept of Biological Sciences  
INSTITUTION: Macquarie University  
NSW, Australia  
DATE: 28 April 2013

NAME: Jeffrey A. Hutchings  
POSITION: Professor  
INSTITUTION: Department of Biology, Dalhousie  
University, CANADA, and Centre for Ecological  
and Evolutionary Synthesis, University of Oslo,  
NORWAY  
DATE: April 25, 2013

## I

NAME: Rolf A. Ims  
POSITION: Professor of Ecology  
INSTITUTION: Department of Arctic and Marine  
Biology, University of Tromsø, Norway  
DATE: May 3, 2013

NAME: Brian Inouye  
POSITION: Associate Professor  
INSTITUTION: Florida State University  
DATE: April 25, 2013

NAME: David W. Inouye  
POSITION: Professor  
INSTITUTION: University of Maryland  
DATE: 25 April 2013

## J

NAME: Nina G. Jablonski  
POSITION: Distinguished Professor of Anthropology  
INSTITUTION: The Pennsylvania State University  
DATE: May 4, 2013

NAME: Wes Jackson  
POSITION: President  
INSTITUTION: The Land Institute  
DATE: April 30, 2013

NAME: A. Hope Jahren  
POSITION: Professor of Geobiology  
INSTITUTION: University of Hawaii at Manoa  
DATE: April 29, 2013

NAME: Fabian M Jaksic  
POSITION: Professor  
INSTITUTION: Universidad Catolica de Chile  
DATE: April 28, 2013

NAME: Marco A. Janssen  
POSITION: Associate Professor  
INSTITUTION: School of Human Evolution and  
Social Change, Arizona State University  
DATE: April 25, 2013

NAME: Ivan Janssens  
POSITION: Professor  
INSTITUTION: Biology Department, University of  
Antwerp, Belgium

DATE: 19/05/13

NAME: Daniel H. Janzen  
POSITION: Professor of Conservation Biology  
INSTITUTION: University of Pennsylvania  
DATE: 26 April 2013

NAME: Dr. Christopher B Jones  
POSITION: Faculty  
INSTITUTION: School of Public Policy and  
Administration, Walden University  
DATE: Apr 26, 2013

NAME: James Holland Jones  
POSITION: Associate Professor of Anthropology  
and Senior Fellow, Woods Institute for the  
Environment  
INSTITUTION: Stanford University  
DATE: 18 May 2013

NAME: Jeremy B. Jones  
POSITION: Professor of Biology  
INSTITUTION: University of Alaska Fairbanks  
DATE: May 19, 2013

NAME: Patricia P. Jones, Ph.D.  
POSITION: Professor of Biology  
INSTITUTION: Stanford University  
DATE: May 17, 2013

NAME: William Jury  
POSITION: Emeritus Distinguished Professor of Soil  
Physics  
INSTITUTION: UC Riverside  
DATE: 4/25/2013

## K

NAME: Dr Jules Kajtar  
POSITION: Research Associate  
INSTITUTION: Climate Change Research Centre,  
University of New South Wales, Australia  
DATE: 29/04/13

NAME: Dibesh Karmacharya  
POSITION: International Director  
INSTITUTION: Center for Molecular Dynamics Nepal  
DATE: May 8, 2013

NAME: David Karoly  
POSITION: Professor of Climate Science  
INSTITUTION: University of Melbourne  
DATE: April 29, 2013

NAME: Daniel Karp  
POSITION: Postdoctoral Scholar  
INSTITUTION: University of California, Berkeley and  
The Nature Conservancy  
DATE: 4/25/2013

NAME: Shakkie Kativu  
POSITION: Professor  
INSTITUTION: University of Zimbabwe  
DATE: 17 May 2013

NAME: LILIANA KATINAS  
POSITION: PROFESSOR OF PLANT MORPHOLOGY  
INSTITUTION: UNIVERSIDAD NACIONAL DE LA  
PLATA, ARGENTINA  
DATE: MAY 19, 2013

NAME: Donald Kennedy  
POSITION: President Emeritus and Bing Professor  
of Environmental Science, Emeritus; Editor-in-  
Chief, Science, 2000 to 2008  
INSTITUTION: Stanford University  
DATE: April 25, 2013



NAME: Julie Kennedy  
POSITION: Professor (Teaching), Environmental  
Earth System Science  
INSTITUTION: Stanford University  
DATE: May 21, 2013

NAME: Thomas Kjørboe  
POSITION: Professor, Centre Leader  
INSTITUTION: Centre for Ocean Life, National  
Institute of Aquatic Resources, Technical  
University of Denmark  
DATE: May 15, 2013

NAME: Patrick V. Kirch  
POSITION: Class of 1954 Professor of Anthropology  
and  
Integrative Biology  
INSTITUTION: University of California, Berkeley  
DATE: 29 April 2013

NAME: James Barrie Kirkpatrick  
POSITION: Distinguished Professor of Geography  
and Environmental Studies  
INSTITUTION: University of Tasmania  
DATE: 26/4/2013

NAME: Professor Roger Kitching AM  
POSITION: Chair of Ecology  
INSTITUTION: Griffith University, Brisbane  
DATE: 26.4.2010

NAME: Alan K. Knapp  
POSITION: Professor of Biology  
INSTITUTION: Colorado State University  
DATE: April 25, 2013

NAME: Andrew H. Knoll  
POSITION: Fisher Professor of Natural History  
INSTITUTION: Harvard University  
DATE: April 30, 2013

NAME: Matthew L. Knope  
POSITION: Post-doctoral research fellow  
INSTITUTION: Dept. of Geological and  
Environmental Sciences, Stanford University  
DATE: April 25, 2013

NAME: Jacob Koella  
POSITION: Professor  
INSTITUTION: University of Neuchatel  
DATE: 4/30/2013

NAME: Jeffrey R Koseff  
POSITION: William A Campbell and Martha  
Campbell Professor of Engineering  
INSTITUTION: Stanford University  
DATE: May 16 2013

NAME: Dr Tineke Kraaij  
POSITION: Scientist: Fynbos Ecology  
INSTITUTION: South African National Parks  
DATE: 10 May 2013

NAME: Nathan Kraft  
POSITION: Assistant Professor  
INSTITUTION: Department of Biology, University of  
Maryland College Park  
DATE: 5/7/2013

NAME: Holger Kreft  
POSITION: Professor  
INSTITUTION: Faculty of Forest Sciences and Forest  
Ecology, University of Gottingen  
DATE: May 17 2013

NAME: Claire Kremen  
POSITION: Professor  
INSTITUTION: University of California, Berkeley  
DATE: 4/25/13

NAME: Andrew Krockenberger  
POSITION: Professor and Dean of Research  
INSTITUTION: James Cook University  
DATE: 20th May 2013

NAME: Markku Kulmala  
POSITION: Academy Professor  
INSTITUTION: University of Helsinki, Department  
of Physics  
DATE: 2.5. 2013

NAME: Juri Kurhinen  
POSITION: researcher, Helsinki University  
INSTITUTION: coordinator of the international  
project  
DATE: 02.05.2013

NAME: Thomas A. Kursar  
POSITION: Professor  
INSTITUTION: University of Utah (Dept of Biology)  
DATE: 27 April, 2013

## L

NAME: Eric Lambin  
POSITION: Professor  
INSTITUTION: Stanford University and Université  
catholique de Louvain  
DATE: May 18, 2013

NAME: Dr. Tomás Landete-Castillejos  
POSITION: Vice-director of IREC (Spain's national  
game institute); Vicepresident of FEDFA  
(European Federation of Deer Farmers  
Associations; www.fedfa.es); founder of science-  
based companies: European Meeting on Antlers  
and Deer International Scientific Training S.L.  
(www.emad.es); Venadogen (www.venadogen.  
com).  
INSTITUTION: University of Castilla-La Mancha  
DATE: May 7th 2013

NAME: John Largier  
POSITION: Professor of Oceanography  
INSTITUTION: University of California Davis  
DATE: 5 May 2013

NAME: William F. Laurance  
POSITION: Distinguished Research Professor &  
Australian Laureate  
INSTITUTION: James Cook University, Cairns,  
Queensland, Australia  
DATE: 20 May 2013

NAME: Beverly E. Law  
POSITION: Professor Global Change Biology &  
Terrestrial Systems Science  
INSTITUTION: Department of Forest Ecosystems &  
Society, Oregon State University  
DATE: May 10, 2013

NAME: Prof. Mike Lawes  
POSITION: Professor, Savanna Management and  
Wildlife Conservation, Research Institute For The  
Environment And Livelihoods  
INSTITUTION: Charles Darwin University  
Darwin, Northern Territory 0909, AUSTRALIA  
DATE: 26 April 3013

NAME: Dr Susan Lawler  
POSITION: Head of Department of Environmental  
Management and Ecology  
INSTITUTION: La Trobe University, Wodonga,  
Victoria, Australia  
DATE: 20 May 2013

NAME: Stephanie Lawson  
POSITION: Professor of Politics and International

Relations  
INSTITUTION: Macquarie University, Sydney, NSW,  
Australia  
DATE: 1 May 2013

NAME: Yvon LE MAHO  
POSITION: Director of Research  
INSTITUTION: Institut Pluridisciplinaire Hubert  
Curien, CNRS and University of Strasbourg,  
France  
DATE: May 10, 2013.

NAME: Raphael Leblois  
POSITION: researcher  
INSTITUTION: INRA (French National Institute for  
Agronomic Research), Lab "Center for Biology  
and Population Management", CBGP, Montpellier,  
France  
DATE: 4th of May, 2013

NAME: Herwig Leirs  
POSITION: Professor, Evolutionary Ecology Group  
and Dean, Faculty of Sciences  
INSTITUTION: University of Antwerp, Belgium  
DATE: 17 may 2013

NAME: Yuri L. R. Leite  
POSITION: Associate Professor  
INSTITUTION: Universidade Federal do Espírito  
Santo, Brazil  
DATE: 17 May 2013

NAME: Jennifer Leonard  
POSITION: permanent researcher  
INSTITUTION: Estación Biológica de Doñana,  
Consejo Superior de Investigaciones Científicas  
DATE: April 25, 2013

NAME: Estella B. Leopold  
POSITION: Professor Emeritus, Department of  
Biology  
INSTITUTION: University of Washington  
DATE: April 23, 2013

NAME: Simon Levin  
POSITION: Professor  
INSTITUTION: Princeton University  
DATE: April 25, 2013

NAME: William Z. Lidicker, Jr.  
POSITION: Professor of Integrative Biology Emeritus  
INSTITUTION: University of California, Berkeley  
DATE: 29 April 2013

NAME: Kent Lightfoot  
POSITION: Professor, Department of Anthropology  
INSTITUTION: UC Berkeley  
DATE: May 8, 2013

NAME: MAURICIO LIMA  
POSITION: FULL PROFESSOR  
INSTITUTION: DEPARTAMENTO DE ECOLOGÍA,  
FACULTAD DE CIENCIAS BIOLÓGICAS,  
PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE  
DATE: 25/04/2013

NAME: Ken Lindema  
POSITION: Professor, Sustainability Program Chair  
INSTITUTION: Florida Institute of Technology  
DATE: April 27, 2013

NAME: Richard L. Lindroth  
POSITION: Professor and Associate Dean for  
Research  
INSTITUTION: University of Wisconsin-Madison  
DATE: April 29, 2013

NAME: Lee Hsiang Liow  
POSITION: Researcher  
INSTITUTION: Centre for Ecological and Evolutionary

Synthesis, Department of Biosciences,  
University of Oslo, Oslo, Norway  
DATE: 25 April 2013

NAME: Jere H. Lipps  
POSITION: Professor Emeritus  
INSTITUTION: University of California, Berkeley  
DATE: April 29, 2013

NAME: Professor Adrian M Lister  
POSITION: Research Leader  
INSTITUTION: The Natural History Museum, London  
DATE: 13th May 2013

NAME: Jianguo (Jack) Liu  
POSITION: Rachel Carson Chair in Sustainability  
and Director  
INSTITUTION: Center for Systems Integration and  
Sustainability, Michigan State University  
DATE: 4/26/13

NAME: Dr John Llewelyn  
POSITION: Postdoctoral research fellow  
INSTITUTION: James Cook University, Australia  
DATE: 20/5/2013

NAME: Jorge Miguel Lobo  
POSITION: Research professor of the Museo  
Nacional de Ciencias Naturales (CSIC)  
INSTITUTION: Museo Nacional de Ciencias  
Naturales (CSIC). C/ Jose Gutiérrez Abascal 2.  
Madrid  
DATE: 13 May 2013

NAME: Michael E. Loik  
POSITION: Associate Professor, Department of  
Environmental Studies  
INSTITUTION: University of California, Santa Cruz  
DATE: April 25, 2013

NAME: Adam Lomnicki  
POSITION: Professor Emeritus of Biology  
INSTITUTION: Institute of Environmental Sciences,  
Jagiellonian University, Krakow, Poland  
DATE: 18th of May 2013

NAME: John Longino  
POSITION: Professor  
INSTITUTION: Department of Biology, University of  
Utah  
DATE: 26 April 2013

NAME: Cindy V. Looy  
POSITION: Assistant Professor  
INSTITUTION: UC Berkeley and UC Museum of  
Paleontology  
DATE: April 29, 2013

NAME: Celia López-González  
POSITION: Profesor Titular  
CIIDIR Unidad Durango  
INSTITUTION: Instituto Politécnico Nacional  
DATE: May 10 2013

NAME: Jonathan Losos  
POSITION: Professor and Curator  
INSTITUTION: Dept of Organismic and Evolutionary  
Biology and Museum of Comparative Zoology,  
Harvard University  
DATE: April 28, 2013

NAME: Thomas E. Lovejoy  
POSITION: University Professor  
INSTITUTION: George Mason University  
DATE: April 25, 2013

NAME: Richard Loyn  
POSITION: Ecologist; Director, Eco Insights, and  
recently Principal Scientist, Arthur Rylah  
Institute for Environmental Research (Victorian

Government)  
INSTITUTION: Eco Insights (also research fellow  
at La Trobe University; honorary senior Fellow  
at University of Melbourne & Charles Sturt  
University)  
DATE: 8 May 2013

NAME: Stephen Luby  
POSITION: Professor or Medicine  
INSTITUTION: Stanford University  
DATE: April 29, 2013

NAME: Gary Luck  
POSITION: Professor in Ecology and Interdisciplinary  
Science  
INSTITUTION: Charles Sturt University, Institute for  
Land, Water and Society  
DATE: 19th May 2013

NAME: Per Lundberg  
POSITION: Professor  
INSTITUTION: Dept. Biology, Lund University, Lund,  
Sweden  
DATE: 30 April, 2013

NAME: Ian D. Lunt  
POSITION: Associate Professor in Vegetation  
Ecology & Management  
INSTITUTION: Institute for Land, Water & Society,  
Charles Sturt University, Australia  
DATE: 20 May 2013

## M

NAME: Manuel Maass  
POSITION: Research Scientist  
INSTITUTION: Centro de Investigaciones en  
Ecosistemas (CIEco), Universidad Nacional  
Autónoma de México (UNAM)  
DATE: April 27, 2013

NAME: Georgina Mace  
POSITION: Professor of Biodiversity and Ecosystems  
INSTITUTION: University College London  
DATE: 10 May 2013

NAME: James A. MacMahon  
POSITION: Dean, College of Science  
INSTITUTION: Utah State University  
DATE: 25 April 2013

NAME: Adjunct Prof Jonathan Majer  
POSITION: Recently retired as Professor of  
Invertebrate Conservation  
INSTITUTION: Curtin University, Perth, Western  
Australia  
DATE: 26/Apr/13

NAME: Stephanie A. Malin, Ph.D.  
POSITION: Mellon Foundation Postdoctoral Fellow  
with Center for Environmental Studies and  
Superfund Research Program  
INSTITUTION: Brown University  
DATE: 26 April 2013

NAME: Michael A. Mallin  
POSITION: Research Professor  
INSTITUTION: Center for Marine Science, University  
of North Carolina Wilmington  
DATE: April 25, 2013

NAME: Michael E. Mann  
POSITION: Distinguished Professor of Meteorology;  
Director of Penn State Earth System Science  
Center  
INSTITUTION: Pennsylvania State University  
DATE: May 18, 2013

NAME: W. Andrew Marcus  
POSITION: Professor of Geography & Associate  
Dean, Social Sciences  
INSTITUTION: University of Oregon  
DATE: April 29, 2013

NAME: Dr Martine Maron  
POSITION: Senior Lecturer in Environmental  
Management  
INSTITUTION: The University of Queensland  
DATE: 10 May 2013

NAME: Pablo Marquet  
POSITION: Full Professor of Ecology  
INSTITUTION: Pontificia Universidad Católica de  
Chile  
DATE: April 28, 2013

NAME: Jason P. Marshall  
POSITION: Senior Lecturer of Ecology  
INSTITUTION: University of the Witwatersrand  
DATE: 9 May 2013

NAME: Richard A. Marston  
POSITION: University Distinguished Professor  
INSTITUTION: Kansas State University  
DATE: 30 April 2013

NAME: Airam Rodríguez Martín  
POSITION: Postdoctoral Researcher  
INSTITUTION: Estación Biológica de Doñana CSIC  
DATE: 25 April 2013

NAME: Jean-Noël Martinez  
POSITION: Professor of Geology and Director of  
the Paleontological Institute at the National  
University of Piura  
INSTITUTION: National University of Piura - Peru  
DATE: 17th May 2013

NAME: Enrique Martínez-Meyer  
POSITION: Researcher  
INSTITUTION: Instituto de Biología, Universidad  
Nacional Autónoma de México  
DATE: May 10, 2013

NAME: Gil Masters  
POSITION: Professor (Emeritus)  
INSTITUTION: Civil and Environmental Engineering  
Department, Stanford University  
DATE: May 20, 2013

NAME: Damon Matthews  
POSITION: Associate Professor  
INSTITUTION: Concordia University, Montreal,  
Canada  
DATE: April 29, 2013

NAME: Erik Matthysen  
POSITION: Professor, Evolutionary Ecology Group  
INSTITUTION: University of Antwerp, Belgium  
DATE: 17 May 2013

NAME: Kevin McCann  
POSITION: Canadian Research Chair in Biodiversity  
INSTITUTION: University of Guelph  
DATE: May 13, 2013

NAME: Perry L. McCarty  
POSITION: Silas H. Palmer Professor Emeritus,  
Environmental Engineering  
INSTITUTION: Stanford University  
DATE: May 20, 2013

NAME: Susan K. McConnell, Ph.D.  
POSITION: Susan B. Ford Professor  
INSTITUTION: Stanford University  
DATE: May 16, 2013

NAME: Michael McGehee

POSITION: Associate Professor of Materials Science  
and Engineering  
INSTITUTION: Stanford University  
DATE: May 20, 2013

NAME: Dr. Peter B. McIntyre  
POSITION: Assistant Professor  
INSTITUTION: University of Wisconsin  
DATE: 26 April 2013

NAME: Galen A. McKinley  
POSITION: Associate Professor of Atmospheric  
and Oceanic Sciences; Faculty Affiliate, Center  
for Climatic Research, Nelson Institute for  
Environmental Studies  
INSTITUTION: University of Wisconsin - Madison  
DATE: May 1, 2013

NAME: Sarah McMenamin  
POSITION: Postdoctoral Researcher  
INSTITUTION: University of Washington  
DATE: April 25, 2013

NAME: Rodrigo A. Medellin  
POSITION: Senior Professor of Ecology  
INSTITUTION: National Autonomous University of  
Mexico  
DATE: April 25, 2013

NAME: Timothy D. Meehan  
POSITION: Associate Scientist  
INSTITUTION: Wisconsin Energy Institute, University  
of Wisconsin-Madison  
DATE: 29 May 2013

NAME: Katrin Meissner  
POSITION: Associate Professor  
INSTITUTION: University of New South Wales  
DATE: 29.04.2013

NAME: Natalia Gañán Mejías  
POSITION: Postdoctoral researcher  
INSTITUTION: Unaffiliated  
DATE: 26/04/2013

NAME: David J. Meltzer  
POSITION: Henderson-Morrison Professor of  
Prehistory  
INSTITUTION: Southern Methodist University  
DATE: May 13, 2013

NAME: Sarah Keene Meltzoff  
POSITION: Associate Professor  
INSTITUTION: Rosenstiel School of Marine and  
Atmospheric Science, University of Miami  
DATE: 28 April 2013

NAME: Santiago Merino  
POSITION: Professor of Research  
INSTITUTION: Higher Council for Scientific Research  
(CSIC-SPAIN)  
DATE: 25-04-2013

NAME: Laura A. Meyerson  
POSITION: Associate Professor  
INSTITUTION: University of Rhode Island  
DATE: May 2, 2013

NAME: Fiorenza Micheli  
POSITION: Professor  
INSTITUTION: Stanford University, Hopkins Marine  
Station  
DATE: 25 April 2013

NAME: Edward L. Miles  
POSITION: Professor Emeritus of Marine Studies  
and Public Affairs, School of Marine Studies and  
Environmental Affairs  
INSTITUTION: University of Washington  
DATE: May 3, 2013

NAME: Brian Miller, Ph.D.  
POSITION: Senior Scientist  
INSTITUTION: Wind River Ranch Foundation, PO Box  
27, Watrous NM 87753  
DATE: April 25, 2013

NAME: L. Scott Mills  
POSITION: Professor  
INSTITUTION: Department of Ecosystem and  
Conservation Sciences, University of Montana  
DATE: May 3, 2013

NAME: Professor Bruce Milthorpe  
POSITION: Dean of Science  
INSTITUTION: University of Technology Sydney  
DATE: 1 May 2013

NAME: David P. Mindell  
POSITION: Visiting Professor  
INSTITUTION: University of California, San Francisco  
DATE: 25 April 2013

NAME: Brent D. Mishler  
POSITION: Professor of Integrative Biology, Director  
of the University and Jepson Herbaria  
INSTITUTION: University of California, Berkeley  
DATE: April 29, 2013

NAME: Cary J. Mock  
POSITION: Professor of Geography  
INSTITUTION: University of South Carolina,  
Columbia  
DATE: 5/13/2013

NAME: Atte Moilanen  
POSITION: Professor, Conservation Decision  
Analysis  
INSTITUTION: University of Helsinki, Dept.  
Biosciences  
DATE: April 25, 2013

NAME: David R. Montgomery  
POSITION: Professor (Geomorphology)  
INSTITUTION: University of Washington  
DATE: 5/7/13

NAME: Arne O. Mooers  
POSITION: Professor of Biodiversity  
INSTITUTION: Simon Fraser University, Canada  
DATE: April 25, 2013

NAME: Harold A. Mooney  
POSITION: Professor Emeritus, Department of  
Biology, and Senior Fellow, Woods Institute  
INSTITUTION: Stanford University  
DATE: April 23, 2013

NAME: MORAND Serge  
POSITION: DR CNRS, Université de Montpellier 2  
INSTITUTION: CNRS (Centre National de la  
Recherche, France)  
DATE: 02/06/2013

NAME: Juan Moreno  
POSITION: Research Professor CSIC (Spanish  
Council for Scientific Research)  
INSTITUTION: Department of Evolutionary Ecology,  
National Museum  
of Natural Sciences (CSIC), Madrid, Spain  
DATE: 26 April 2013

NAME: Christopher Moy  
POSITION: Lecturer  
INSTITUTION: University of Otago, New Zealand  
DATE: May 19, 2013

NAME: Prof. Dr. Andreas Mulch  
POSITION: Vice Director Biodiversity and Climate  
Research Centre Frankfurt

INSTITUTION: Biodiversity and Climate Research  
Centre Frankfurt  
DATE: 17.05.2013

NAME: Geoffrey Mwachala  
POSITION: Director of Collections and Research  
INSTITUTION: National Museums of Kenya  
DATE: 20 June 2013

NAME: John Peterson Myers  
POSITION: CEO and Chief Scientist  
INSTITUTION: Environmental Health Sciences,  
Charlottesville, Virginia  
DATE: April 23, 2013

NAME: Atle Mysterud  
POSITION: Professor  
INSTITUTION: University of Oslo, Norway  
DATE: 25. April 2013

## N

NAME: Nalini Nadkarni  
POSITION: Full Professor, Dept of Biology, and  
Director,  
Center for Science and Mathematics Education  
INSTITUTION: University of Utah  
DATE: April 26, 2013

NAME: Shahid Naeem  
POSITION: Professor of Ecology  
INSTITUTION: Columbia University  
DATE: 25 April 2013

NAME: Tohru Nakashizuka  
POSITION: Professor  
INSTITUTION: Graduate School of Life Sciences,  
Tohoku University  
DATE: May 7, 2013.

NAME: Rosamond L. Naylor  
POSITION: Director, Program on Food Security and  
the Environment and Professor, Department of  
Environmental Earth System Science  
INSTITUTION: Stanford University  
DATE: April 23, 2013

NAME: Ioan Negrutiu  
POSITION: Professor biology  
INSTITUTION: ENS Lyon, Michel Serres Institute  
DATE: April 25, 2013

NAME: Tarique Niazi  
POSITION: Associate Professor of Environmental  
Sociology  
INSTITUTION: University of Wisconsin-Eau Claire  
DATE: May 2, 2013

NAME: GRACIELA G. NICOLA  
POSITION: FULL PROFESSOR  
INSTITUTION: UNIVERSITY OF CASTILLA-LA MANCHA  
(UCLM), SPAIN  
DATE: 29/04/2013

NAME: Prof. Dr. Manfred Niekisch  
POSITION: University Professor and Zoo Director  
INSTITUTION: Goethe University and Frankfurt Zoo  
DATE: 17. May 2013

NAME: Rasmus Nielsen  
POSITION: Professor  
INSTITUTION: University of California - Berkeley  
DATE: April 29 2013

NAME: Dale G. Nimmo  
POSITION: Research Fellow  
INSTITUTION: Deakin University, Australia  
DATE: 20-05-2012

NAME: DAVID NOGUÉS-BRAVO  
POSITION: ASSOCIATE PROFESSOR  
INSTITUTION: UNIVERSITY OF COPENHAGEN  
DATE: 25-APRIL-2013

NAME: NORET Nausicaa  
POSITION: ASSISTANT PROFESSOR  
INSTITUTION: UNIVERSITE LIBRE DE BRUXELLES  
DATE: 30 04 2013

NAME: Christopher M. Nyamai  
POSITION: Senior Lecturer, Chair, Department of  
Geology  
INSTITUTION: University of Nairobi  
DATE: 15<sup>th</sup> May 2013

## O

NAME: Karen Oberhauser  
POSITION: Professor  
INSTITUTION: University of Minnesota  
DATE: 4/29/2013

NAME: Timothy G. O'Connor  
POSITION: Observation Scientist (plus Honorary  
Professor, School of Animal, Plant and  
Environmental Sciences)  
INSTITUTION: South African Environmental  
Observation Network, PO Box 2600, Pretoria  
0001, South Africa (University of the  
Witwatersrand, Johannesburg, South Africa)  
DATE: 20 May 2013

NAME: John C. Ogden  
POSITION: Emeritus Professor  
INSTITUTION: University of South Florida (USF)  
DATE: April 30, 2013

NAME: Onesmo K. ole-MoiYoi MD, DSc (hc), EBS  
(Kenya)  
POSITION: Chair Board of Management  
INSTITUTION: Kenya Agricultural Research Institute  
DATE: 14 May 2013

NAME: Gordon H. Orians  
POSITION: Professor Emeritus of Biology  
INSTITUTION: University of Washington, Seattle,  
WA 98195  
DATE: April 25, 2013

NAME: Dr. Jamie F Orr  
POSITION: Adjunct Faculty, Physics & Engineering,  
Foothill College & Faculty Researcher, NASA  
Ames Research Center  
INSTITUTION: Foothill College and NASA Ames  
Research Center  
DATE: May 15, 2013

NAME: John Orrock  
POSITION: Assistant Professor  
INSTITUTION: Department of Zoology, University of  
Wisconsin-Madison  
DATE: April 30, 2013

NAME: Otso Ovaskainen  
POSITION: Professor  
INSTITUTION: University of Helsinki, Finland  
DATE: April 25th 2013

NAME: Norman Owen-Smith  
POSITION: Emeritus Research Professor  
INSTITUTION: University of the  
Witwatersrand, Johannesburg  
DATE: May 9, 2013

## P

NAME: LUIS F. PACHECO  
POSITION: PROFESSOR AND RESEARCHER  
INSTITUTION: INSTITUTO DE ECOLOGÍA,  
UNIVERSIDAD MAYOR DE SAN ANDRÉS, LA PAZ,  
BOLIVIA  
DATE: 24 APRIL, 2013

NAME: Kevin Padian  
POSITION: Professor and Curator  
INSTITUTION: University of California, Berkeley  
DATE: 4/29/2013

NAME: Dianna K Padilla  
POSITION: Professor, Department of Ecology and  
Evolution  
INSTITUTION: Stony Brook University  
DATE: April 25 2013

NAME: Stephen Palumbi  
POSITION: Professor, Department of Biology and  
Director, Hopkins Marine Station  
INSTITUTION: Stanford University  
DATE: April 23, 2013

NAME: John M. Pandolfi  
POSITION: Professor  
INSTITUTION: University of Queensland, Brisbane,  
Queensland, AUSTRALIA  
DATE: 26 April 2013

NAME: Mario Garcia Paris  
POSITION: Permanent Researcher (Investigador  
Científico)  
INSTITUTION: MNCN-CSIC (Museo Nacional  
de Ciencias Naturales-Consejo Superior de  
Investigaciones Cientificas, Spain)  
DATE: 25/April/2013

NAME: James L. Patton, PhD  
POSITION: Curator and Professor Emeritus  
INSTITUTION: Museum of Vertebrate Zoology and  
Department of Integrative Biology, University of  
California, Berkeley  
DATE: 25 April 2013

NAME: Daniel Pauly  
POSITION: Professor of Fisheries  
INSTITUTION: Fisheries Centre, University of British  
Columbia, Vancouver, Canada  
DATE: April 10, 2013

NAME: Jonathan L. Payne  
POSITION: Associate Professor  
INSTITUTION: Dept. of Geological & Environmental  
Sciences, Stanford University  
DATE: April 28, 2013

NAME: Richard G. Pearson  
POSITION: Emeritus Professor  
INSTITUTION: James Cook University, Australia  
DATE: May 20, 2013

NAME: Kabir G. Peay  
POSITION: Assistant Professor  
INSTITUTION: Stanford University  
DATE: 4/25/2013

NAME: Pablo Pelaez-Campomanes  
POSITION: Senior researcher  
INSTITUTION: National Museum of Natural  
Sciences, CSIC, Spain  
DATE: 25/04/2013

NAME: Petri Pellikka  
POSITION: Professor of Geoinformatics  
INSTITUTION: University of Helsinki  
DATE: 15.5.2013

NAME: Dr Avril Pereira  
POSITION: Research Fellow

INSTITUTION: The Florey Institute of Neuroscience  
and Mental Health  
DATE: 20 May, 2013

NAME: Henrique Miguel Pereira  
POSITION: Invited Professor  
INSTITUTION: Faculty of Sciences of the University  
of Lisbon, Portugal  
DATE: 13 May 2013

NAME: Melissa Pespeni  
POSITION: National Science Foundation  
Postdoctoral Fellow in Biology  
INSTITUTION: Indiana University  
DATE: April 25, 2013

NAME: Owen Petchey  
POSITION: Professor  
INSTITUTION: University of Zurich  
DATE: 8th May 2013

NAME: Dmitri Petrov  
POSITION: Professor of Biology  
INSTITUTION: Stanford University  
DATE: 5/20/13

NAME: Ben Phillips  
POSITION: Senior Research Fellow  
INSTITUTION: Centre for Tropical Biodiversity and  
Climate Change, James Cook University  
DATE: 20 May 2013

NAME: Theunis Piersma  
POSITION: Professor of Global Flyway Ecology  
INSTITUTION: University of Groningen/Royal  
Netherlands Institute for Sea Research (NIOZ)  
DATE: 18 May 2013

NAME: Stuart Pimm  
POSITION: Doris Duke Chair of Conservation  
INSTITUTION: Duke University  
DATE: 28th April 2013

NAME: Stephanie Pincetl, PhD  
POSITION: Adjunct Professor,  
Director, Center for Sustainable Communities,  
Institute of the Environment and Sustainability  
INSTITUTION: UCLA  
DATE: April 26, 2013

NAME: Malin L. Pinsky  
POSITION: David H. Smith Conservation Research  
Fellow  
INSTITUTION: Princeton University  
DATE: April 24, 2013

NAME: Erica Plambeck  
POSITION: Professor of Operations, Information and  
Technology  
INSTITUTION: Stanford Graduate School of  
Business  
DATE: May 18 2013

NAME: P. David Polly  
POSITION: Professor  
INSTITUTION: Department of Geological  
Sciences, Indiana University  
DATE: 25 April 2013

NAME: Warren P. Porter  
POSITION: Professor of Zoology and Professor of  
Environmental Toxicology  
INSTITUTION: University of Wisconsin, Madison  
DATE: 25 April 2013

NAME: Hugh Possingham  
POSITION: Professor and Centre Director  
INSTITUTION: The University of Queensland  
DATE: 25 April 2013



NAME: Malcolm Potts  
POSITION: Professor, School of Public Health  
INSTITUTION: University of California-Berkeley  
DATE: April 25, 2013

NAME: Mary E. Power  
POSITION: Professor  
INSTITUTION: Univ. California, Berkeley  
DATE: April 25, 2013

NAME: Daniel Press  
POSITION: Olga T. Griswold  
Professor, Environmental Studies Department  
and Executive Director, Center for Agroecology  
and Sustainable Food Systems  
INSTITUTION: University of California, Santa Cruz  
DATE: April 28, 2013

NAME: Aili Pyhälä  
POSITION: Postdoctoral Researcher  
INSTITUTION: Department of Biosciences,  
University of Helsinki  
DATE: 25th April 2013

NAME: Dr Graham H. Pyke  
POSITION: Distinguished Professor  
INSTITUTION: School of the Environment, University  
of Technology Sydney  
DATE: 26 April 2013

## Q

## R

NAME: Nancy N. Rabalais  
POSITION: Executive Director and Professor  
INSTITUTION: Louisiana Universities Marine  
Consortium  
DATE: 49 April 2013

NAME: Paul A Racey  
POSITION: Co-Chair, IUCN Bat Specialist Group  
INSTITUTION: Regius Professor of Natural History  
(Emeritus), University of Aberdeen. Honorary  
Visiting Professor, University of Exeter in  
Cornwall  
DATE: 30 April 2013

NAME: Carsten Rahbek  
POSITION: Professor  
INSTITUTION: Center for Macroecology, Evolution  
and Climate, University of Copenhagen,  
Denmark  
DATE: 15 May 2013

NAME: Paul B Rainey  
POSITION: Distinguished Professor  
INSTITUTION: New Zealand Institute for Advanced  
Study & Max Planck Institute for Evolutionary  
Biology.  
DATE: 20.05.13

NAME: Uma Ramakrishnan  
POSITION: Associate Professor  
INSTITUTION: National Centre of Biological  
Sciences, Bangalore, India  
DATE: May 11, 2013

NAME: Giovanni Ramón  
POSITION: Post-graduate student  
INSTITUTION: James Cook University  
DATE: 20/05/2013

NAME: Dr. Eduardo H. Rapoport  
POSITION: Professor Emeritus & Investigador  
Consejo Nacional Investigaciones Científicas

INSTITUTION: Universidad Nacional del Comahue,  
Bariloche, Argentina  
DATE: MAY 20, 2013

NAME: Daniel J. Rasky  
POSITION: Senior Scientist  
INSTITUTION: Self  
DATE: 5/20/2013

NAME: Prof. Peter H. Raven  
POSITION: President Emeritus  
INSTITUTION: Missouri Botanical Garden  
DATE: May 9, 2013

NAME: RAVIGNÉ Virginie  
POSITION: RESEARCHER (permanent position)  
INSTITUTION: CIRAD  
DATE: 21/05/2013

NAME: Dr. John E. Rawlins  
POSITION: Curator of Invertebrate Zoology  
INSTITUTION: Carnegie Museum of Natural History  
DATE: 1 May 2013

NAME: Dr. Maureen E Raymo  
POSITION: Lamont Research Professor and Director  
Lamont-Doherty Core Repository  
INSTITUTION: Lamont-Doherty Earth Observatory of  
Columbia University  
DATE: May 11, 2013

NAME: Harry F. Recher  
POSITION: Emeritus Professor  
INSTITUTION: Edith Cowan University, School of  
Natural Sciences, Joondalup, Western Australia,  
Australia  
DATE: 26 April 2013

NAME: Kent H. Redford  
POSITION: Principal  
INSTITUTION: Archipelago Consulting  
DATE: May 19, 2013

NAME: William E. Rees, PhD, FRSC  
POSITION: Professor Emeritus  
INSTITUTION: University of British Columbia  
DATE: 26 April 2013

NAME: Jonathan Rhodes  
POSITION: Senior Lecturer  
INSTITUTION: The University of Queensland  
DATE: 29<sup>th</sup> April 2013

NAME: Brett R. Riddle  
POSITION: Professor  
INSTITUTION: University of Nevada Las Vegas  
DATE: 26 April 2013

NAME: William J. Ripple  
POSITION: Professor  
INSTITUTION: Oregon State University  
DATE: May 18, 2013

NAME: Euan G. Ritchie  
POSITION: Lecturer in ecology  
INSTITUTION: Deakin University, Australia  
DATE: 18/5/2013

NAME: Annapaola Rizzoli  
POSITION: DVM, PhD, Animal Ecology Research  
Group Leader  
INSTITUTION: Research and Innovation Centre,  
Department of Biodiversity and Molecular  
Ecology, Edmund Mach Foundation, San  
Michele all'Adige (TN), Italy  
DATE: 26/04/2013

NAME: Dr Lisa Roberts  
POSITION: Visiting Fellow, Environmental Science  
/ Design

INSTITUTION: University of Technology, Sydney  
DATE: 29 April 2013

NAME: Heyward G. Robinson  
POSITION: Senior Scientist, Applied Optics  
Laboratory  
INSTITUTION: SRI International  
DATE: 8 May 2013

NAME: John G. Robinson, Ph.D.  
POSITION: Executive Vice President, Conservation  
and Science  
INSTITUTION: Wildlife Conservation Society  
DATE: April 25, 2013

NAME: Johan Rockström  
POSITION: Professor, Water systems and Global  
Sustainability; Director, Stockholm Resilience  
Centre  
INSTITUTION: Stockholm University  
DATE: April 25, 2013

NAME: Antonio Gonzalez Rodriguez  
POSITION: Researcher  
INSTITUTION: Universidad Nacional Autonoma de  
Mexico  
DATE: April 27th, 2013

NAME: Klaus Rohde  
POSITION: Professor Emeritus  
INSTITUTION: University of New England, Armidale,  
Australia  
DATE: 26.4.2013

NAME: Terry L. Root  
POSITION: Senior Fellow  
INSTITUTION: Stanford University  
DATE: 8 May 2013

NAME: Helen Rowe  
POSITION: Assistant Research Professor  
INSTITUTION: School of Life Sciences, Arizona  
State University  
DATE: 4-26-2013

NAME: Lasse Ruokolainen  
POSITION: Postdoctoral fellow  
INSTITUTION: University of Helsinki  
DATE: 26.4.2013

## S

NAME: Takashi Saitoh  
POSITION: Professor  
INSTITUTION: Field Science Center, Hokkaido  
University, Japan  
DATE: May 8, 2013

NAME: Osvaldo Sala  
POSITION: Julie A. Wrigley Professor of Life Sciences  
and Sustainability  
INSTITUTION: Arizona State University  
DATE: 4/25/2013

NAME: Peter F Sale  
POSITION: Assistant Director, Institute for Water,  
Environment and Health  
INSTITUTION: United Nations University  
DATE: April 25th 2013

NAME: Benjamin Santer  
POSITION: Atmospheric Scientist  
INSTITUTION: Lawrence Livermore National  
Laboratory  
DATE: May 18, 2013

NAME: José Sarukhán  
POSITION: National Coordinator, and Professor



Emeritus, UNAM.  
INSTITUTION: Mexican National Commission on  
Biodiversity (CONABIO) and Institute of Ecology,  
UNAM  
DATE: 19th May, 2013

NAME: Dov Sax  
POSITION: Associate Professor of Ecology and  
Evolutionary Biology, Director-Elect for the  
Center for Environmental Studies  
INSTITUTION: Brown University  
DATE: May 10, 2013

NAME: James Schaefer  
POSITION: Professor  
INSTITUTION: Trent University  
DATE: 26 April 2013

NAME: Christoph Scheidegger, Prof. Dr.  
POSITION: Senior Scientist and Chair Research  
Group Biodiversity  
INSTITUTION: Swiss Federal Institute for  
Forest, Snow and Landscape Research,  
WSL, Zürcherstr. 111, CH-8903 Birmensdorf,  
Switzerland  
DATE: April 30, 2013

NAME: William H. Schlesinger  
POSITION: President  
INSTITUTION: Cary Institute of Ecosystem Studies  
DATE: April 25, 2013

NAME: Jan Schnitzler  
POSITION: Postdoctoral Researcher  
INSTITUTION: Biodiversity and Climate Research  
Centre  
(BIK-F) & Goethe University, Frankfurt, Germany  
DATE: May 17, 2013

NAME: Cagan H. Sekercioglu, Ph.D.  
POSITION: Assistant Professor  
INSTITUTION: University of Utah Department of  
Biology  
DATE: May 11, 2013

NAME: Heikki Seppä  
POSITION: Professor  
INSTITUTION: Department of Geosciences and  
Geography, University of Helsinki, Finland  
DATE: May 14, 2013

NAME: Fabrizio Sergio  
POSITION: Researcher (permanent post)  
INSTITUTION: Estacion Biologica de Donana -  
Consejo Superior de Investigaciones Cientificas,  
Seville, Spain  
DATE: 25 April 2013

NAME: DAVID SERRANO  
POSITION: ASSOCIATE PROFESSOR  
INSTITUTION: EBD-CSIC  
DATE: 25 April 2013

NAME: ROSS D. SHACHTER  
POSITION: ASSOCIATE PROFESSOR  
INSTITUTION: STANFORD UNIVERSITY  
DATE: MAY 20, 2013

NAME: Michael Shapira  
POSITION: Adjunct assistant professor  
INSTITUTION: Department of Integrative biology,  
UC Berkeley  
DATE: 4/29/13

NAME: Anne Sheppard  
POSITION: Research Assistant  
INSTITUTION: School of Life Sciences, University of  
Warwick, UK.  
DATE: 26th April 2013

NAME: Steven Sherwood  
POSITION: Professor, Director of the Climate  
Change Research Centre  
INSTITUTION: University of New South Wales  
DATE: 1 May 2013

NAME: Richard Shine  
POSITION: Professor in Biology  
INSTITUTION: University of Sydney  
DATE: 26 April 2013

NAME: Candida Shinn  
POSITION: post-doctoral researcher  
INSTITUTION: IMAR - Instituto do Mar  
DATE: 25.4.2013

NAME: Marisa Sicilia  
POSITION: Post-doctoral researcher  
INSTITUTION: Universidad de Castilla-La Mancha  
(Spain)  
DATE: 13th May 2013

NAME: Fernando Simal  
POSITION: Manager, Natural and Historic Resources  
Unit  
INSTITUTION: STINAPA Bonaire  
DATE: April 26<sup>th</sup>, 2013

NAME: Ellen L. Simms  
POSITION: Professor, Integrative Biology  
INSTITUTION: University of California, Berkeley  
DATE: 29 April 2013

NAME: Javier A. Simonetti  
POSITION: Professor, Facultad de Ciencias,  
Universidad de Chile, Chile  
INSTITUTION: Facultad de Ciencias, Universidad  
de Chile  
DATE: May 20th, 2013

NAME: Jasper Slingsby  
POSITION: Biodiversity Scientist  
INSTITUTION: South African Environmental  
Observation Network  
DATE: 10 May 2013

NAME: Adam B. Smith  
POSITION: Postdoctoral Researcher  
INSTITUTION: Center for Conservation and  
Sustainable Development, Missouri Botanical  
Garden  
DATE: April 25th, 2013

NAME: Kirk R. Smith  
POSITION: Professor of Global Environmental  
Health  
INSTITUTION: University of California Berkeley  
DATE: April 25, 2013

NAME: Martyn T. Smith  
POSITION: Professor and Director, Berkeley Institute  
of the Environment  
INSTITUTION: School of Public Health, University of  
California at Berkeley  
DATE: May 19, 2013

NAME: Dr. Allison A. Snow  
POSITION: Professor of Biology  
INSTITUTION: Ohio State University  
DATE: April 25, 2013

NAME: Janne Soininen  
POSITION: Assistant Professor  
INSTITUTION: Department of Geosciences and  
Geography, University of Helsinki  
DATE: 14.5.2013

NAME: Manuel Soler  
POSITION: Full Professor  
INSTITUTION: Department of Zoology, Granada

University, Spain  
DATE: 25 April 2013

NAME: Michael Soule  
POSITION: Emeritus Professor,  
INSTITUTION: UCSC  
DATE: 4-25-13

NAME: Wayne P. Sousa  
POSITION: Professor  
INSTITUTION: Department of Integrative Biology,  
University of California, Berkeley  
DATE: April 29, 2013

NAME: Donald W. Spady MD, MSc.  
POSITION: Adjunct Associate Professor of Pediatrics  
& Public Health  
INSTITUTION: Faculty of Medicine & Dentistry, and  
School of Public Health, University of Alberta,  
Edmonton, Canada  
DATE: April 28, 2013

NAME: Chelsea Specht  
POSITION: Associate Professor and Curator  
INSTITUTION: University of California, Berkeley  
DATE: 29 April 2013

NAME: THOMAS WIER STAFFORD, JR  
POSITION: RESEARCH PROFESSOR  
INSTITUTION: DEPARTMENT OF PHYSICS &  
ASTRONOMY, UNIVERSITY OF AARHUS, AARHUS,  
DENMARK  
DATE: MAY 9, 2013

NAME: Dr Martin J. Steinbauer  
POSITION: Senior Research Fellow/Entomologist  
INSTITUTION: Department of Zoology, La Trobe  
University, Melbourne, AUSTRALIA  
DATE: 20 May 2013

NAME: Nils Chr. Stenseth  
POSITION: Professor and Chair, Center for  
Ecological and Evolutionary Synthesis, and  
Chief Scientist, Norwegian Institute of Marine  
Research  
INSTITUTION: University of Oslo  
DATE: April 23, 2013

NAME: Jonathon Stillman  
POSITION: Associate Professor - and - Adjunct  
Assistant Professor  
INSTITUTION: San Francisco State University - and -  
University of California Berkeley  
DATE: April 29, 2013

NAME: Robert L. Street  
POSITION: Campbell Professor in the School of  
Engineering [Em]  
INSTITUTION: Stanford University  
DATE: 20 May 2013

NAME: Caroline A E Strömberg  
POSITION: Assistant Professor & Curator of  
Paleobotany  
INSTITUTION: University of Washington, Seattle  
DATE: 05/19/2013

NAME: Simon N. Stuart, PhD  
POSITION: Visiting Professor, Department of Biology  
and Biochemistry, University of Bath  
INSTITUTION: Chair, Species Survival Commission,  
International Union for Conservation of Nature;  
Senior Biodiversity Advisor, Conservation  
International; Senior Biodiversity Advisor, World  
Conservation Monitoring Centre  
DATE: 30 April 2013

NAME: Rashid Sumaila  
POSITION: Professor of Ocean and Fisheries  
Economics

INSTITUTION: Fisheries Centre, University of British Columbia, Vancouver, Canada  
DATE: April 10, 2013

NAME: William Sutherland  
POSITION: Miriam Rothschild Professor of Conservation Biology  
INSTITUTION: University of Cambridge  
DATE: 18 May 2013

NAME: Dr. David Suzuki, Emeritus  
POSITION: Professor, Sustainable Development Research Institute  
INSTITUTION: University of British Columbia, Vancouver, BC, Canada  
DATE: April 29, 2013

NAME: Andrew Szasz  
POSITION: Professor of Environmental Studies  
INSTITUTION: University of California, Santa Cruz  
DATE: April 26, 2013

NAME: Alina M. Szmant  
POSITION: Professor of Marine Biology  
INSTITUTION: Center for Marine Science, University of North Carolina Wilmington  
DATE: April 25, 2013

## T

NAME: Gary M. Tabor  
POSITION: Executive Director  
INSTITUTION: Center for Large Landscape Conservation  
DATE: 25 April, 2013

NAME: Celine Teplitsky  
POSITION: Research scientist  
INSTITUTION: CNRS & French Natural History Museum  
DATE: 29/04/2013

NAME: John Terborgh  
POSITION: Research Professor, Nicholas School of the Environment and Earth Sciences  
INSTITUTION: Duke University  
DATE: April 29, 2013

NAME: Alexey Tesakov  
POSITION: Head of Laboratory for Quaternary Stratigraphy  
INSTITUTION: Geological Institute, Russian Academy of Sciences, Moscow, Russia  
DATE: May 7, 2013

NAME: John N. Thompson  
POSITION: Distinguished Professor of Ecology and Evolutionary Biology  
INSTITUTION: University of California, Santa Cruz  
DATE: 30 April 2013

NAME: Hiroshi Tomimatsu  
POSITION: Associate Professor  
INSTITUTION: Department of Biology, Yamagata University, Japan  
DATE: May 10, 2013

NAME: Susumu Tomiya  
POSITION: Lecturer  
INSTITUTION: University of California, Berkeley  
DATE: May 1, 2013

NAME: Alan Townsend  
POSITION: Professor, Dept of Ecology and Evolutionary Biology Fellow, Institute of Arctic and Alpine Research  
INSTITUTION: University of Colorado, Boulder

DATE: April 25, 2013

NAME: ANNA TRAVESET  
POSITION: RESEARCH PROFESSOR  
INSTITUTION: SPANISH RESEARCH COUNCIL  
DATE: APRIL 26, 2013

## U

## V

NAME: James W. Valentine  
POSITION: Professor of Integrative Biology, Emeritus  
INSTITUTION: UC Berkeley  
DATE: April 19, 2013

NAME: Myriam VALERO  
POSITION: Researcher at the CNRS (Centre National de la Recherche Scientifique)  
INSTITUTION: Station Biologique de Roscoff, France  
DATE: 1st May 2013

NAME: Fernando Valladares  
POSITION: Research Professor  
INSTITUTION: Spanish Council for Scientific Research (CSIC)  
DATE: April 24, 2013

NAME: Jan van der Made  
POSITION: Scientific researcher (Investigador científico)  
INSTITUTION: Consejo Superior de Investigaciones Científicas (CSIC), Museo Nacional de Ciencias Naturales (Madrid, Spain).  
DATE: 25-4-2013

NAME: Marcel van Tuinen  
POSITION: Associate Professor  
INSTITUTION: UNC at Wilmington  
DATE: 4/25/13

NAME: Jake Vander Zanden  
POSITION: Professor  
INSTITUTION: University of Wisconsin-Madison  
DATE: 4/25/2013

NAME: Ella Vázquez-Domínguez, PhD  
POSITION: Full time Researcher,  
INSTITUTION: Instituto de Ecología, UNAM, México  
DATE: 12 May 2013

NAME: Geerat J. Vermeij  
POSITION: Distinguished Professor of Geology, Department of Geology  
INSTITUTION: University of California at Davis  
DATE: April 25, 2013

NAME: Montserrat Vila  
POSITION: Research Professor  
INSTITUTION: estación Biológica de Doñana (EBD-CSIC)  
DATE: April, 25th, 2013

NAME: Peter Vitousek  
POSITION: Professor  
INSTITUTION: Stanford University  
DATE: April 26, 2013

NAME: Kristiina Vogt  
POSITION: Professor and Director of FSB, School of Environmental and Forest Sciences, College of the Environment  
INSTITUTION: University of Washington  
DATE: 6 May 2013

NAME: Henrik von Wehrden  
POSITION: Junior Professor  
INSTITUTION: Leuphana University, Germany, Institute of Ecology/Faculty of Sustainability & Center for Methods  
DATE: 18.05.2013

## W

NAME: Mathis Wackernagel, Ph.D.  
POSITION: President, Global Footprint Network, and Visiting Professor  
INSTITUTION: Cornell University  
DATE: 28 April 2013

NAME: David B. Wake  
POSITION: Professor of the Graduate School in Integrative Biology  
INSTITUTION: University of California at Berkeley  
DATE: April 25, 2013

NAME: Marvalee H. Wake  
POSITION: Professor of the Graduate School, Department of Integrative Biology  
INSTITUTION: University of California-Berkeley  
DATE: April 23, 2013

NAME: Diana H. Wall  
POSITION: University Distinguished Professor and School of Global Environmental Sustainability  
INSTITUTION: Colorado State University  
DATE: April 25, 2013

NAME: Don Waller  
POSITION: John T. Curtis Professor of Botany and Chair, Department of Botany, Biological Aspects of Conservation Major, Wisconsin Ecology  
INSTITUTION: University of Wisconsin – Madison  
DATE: April 26, 2013

NAME: Dr Haydn Washington  
POSITION: Visiting Fellow, Institute of Environmental Studies  
INSTITUTION: University of New South Wales (Australia)  
DATE: 29 April 2013

NAME: Les Watling  
POSITION: Professor  
INSTITUTION: University of Hawaii at Manoa  
DATE: 26 April 2013

NAME: David M Watson  
POSITION: Associate Professor in Ecology  
INSTITUTION: Charles Sturt University  
DATE: 26 April 2013

NAME: Andrew Weaver  
POSITION: Lansdowne Professor and Canada Research Chair  
INSTITUTION: School of Earth and Ocean Sciences, University of Victoria  
DATE: April 25, 2013

NAME: Anthony LeRoy Westerling  
POSITION: Associate Professor, Geography and Environmental Engineering  
INSTITUTION: Sierra Nevada Research Institute, University of California, Merced  
DATE: April 26, 2013

NAME: Dr Desley Whisson  
POSITION: Lecturer in Wildlife and Conservation Biology  
INSTITUTION: School of Life and Environmental Sciences, Deakin University  
DATE: 18 May 2013

NAME: Tim D. White  
 POSITION: Professor, Department of Integrative  
 Biology  
 INSTITUTION: The University of California at  
 Berkeley  
 DATE: May 1, 2013

NAME: Ruscena Wiederholt  
 POSITION: Assistant Research Scientist  
 INSTITUTION: University of Arizona  
 DATE: 4/25/13

NAME: RICARDO LOPEZ WILCHIS  
 POSITION: Senior Researcher and Professor  
 INSTITUTION: Universidad Autónoma  
 Metropolitana-Iztapalapa, Departamento de  
 Biología  
 DATE: May 11, 2013

NAME: J. Allen Williams, Jr.  
 POSITION: Professor Emeritus  
 INSTITUTION: University of Nebraska-Lincoln  
 DATE: May 3, 2013

NAME: Susan L. Williams  
 POSITION: Professor  
 INSTITUTION: Dept. of Evolution & Ecology and  
 Bodega Marine Laboratory, University of  
 California at Davis  
 DATE: 25 April 2013

NAME: Gregory P. Wilson  
 POSITION: Assistant Professor of Biology, Adjunct  
 Curator of Vertebrate Paleontology  
 INSTITUTION: University of Washington and Burke  
 Museum  
 DATE: May 13, 2013

NAME: Ragnar Winther  
 POSITION: Professor of Mathematics  
 INSTITUTION: University of Oslo, Norway  
 DATE: 10 May, 2013

NAME: Connie Woodhouse

POSITION: Professor  
 INSTITUTION: School of Geography and  
 Development, University of Arizona  
 DATE: May 16, 2013

NAME: Dawn J. Wright, Ph.D., GISP  
 POSITION: Chief Scientist  
 INSTITUTION: Environmental Systems Research  
 Institute (Esri)  
 DATE: April 26, 2013

NAME: Carl Wunsch  
 POSITION: Cecil and Ida Green Professor of Physical  
 Oceanography, emeritus, MIT and Visiting  
 Professor of Physical Oceanography and Climate  
 INSTITUTION: Harvard U. and MIT.  
 DATE: 14 May 2013

## X

## Y

NAME: Norman Yan, PhD, FRSC  
 POSITION: Professor  
 INSTITUTION: York University, Toronto, Canada  
 DATE: April 28, 2013

NAME: Ruifu Yang  
 POSITION: Professor  
 INSTITUTION: Beijing Inst. Microbiol. Epidemiol.  
 DATE: 19 May, 2013

NAME: Charles Yanofsky  
 POSITION: Emeritus Professor of Biology  
 INSTITUTION: Stanford University  
 DATE: May 17, 2013

NAME: Thamasak Yeemin, D.Sc.  
 POSITION: D. Sc., Marine Biodiversity Research  
 Group, Department of Biology, Faculty of

Science  
 INSTITUTION: Ramkhamhaeng University, Huamark,  
 Bangkok 10240, THAILAND  
 DATE: 21 May 2013

## Z

NAME: Dr Jan Zalasiewicz  
 POSITION: Senior Lecturer in Palaeobiology  
 INSTITUTION: University of Leicester  
 DATE: 7 May 2013

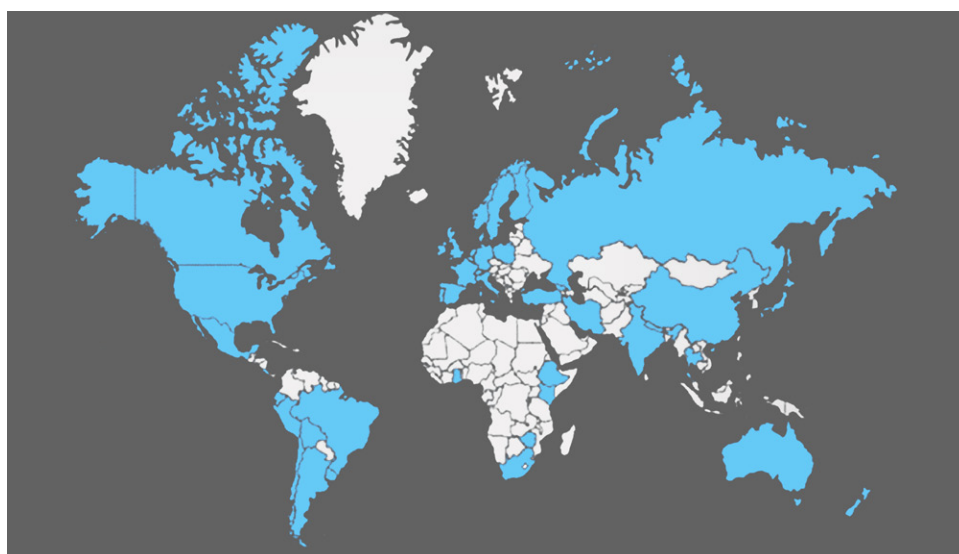
NAME: Luis Zambrano  
 POSITION: Professor / Reseracher  
 INSTITUTION: Biology Insitute at National  
 Autonomous Univeristy of Mexico  
 DATE: May 3rd 2013

NAME: Hugo Tomás Zamora Meza  
 POSITION: Biologist,  
 INSTITUTION: Research Associate at the Natural  
 History Museum of the National University of St  
 Augustin of Arequipa, Peru - Bat Conservation  
 Program in Peru  
 DATE: May 2, 2013

NAME: Kelly R. Zamudio  
 POSITION: Professor of Ecology & Evolutionary  
 Biology  
 INSTITUTION: Cornell University  
 DATE: April 29, 2013

NAME: Joy B. Zedler  
 POSITION: Professor of Botany and Aldo Leopold  
 Chair of Restoration Ecology  
 INSTITUTION: University of Wisconsin - Madison  
 DATE: 4/30/2013

NAME: Liping Zhou  
 POSITION: Professor, Department of Geography  
 INSTITUTION: Peking University  
 DATE: 18 May 2013



Countries (blue) from which 522 scientists have signed as of May 21, 2013. 3PM PDT