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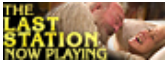


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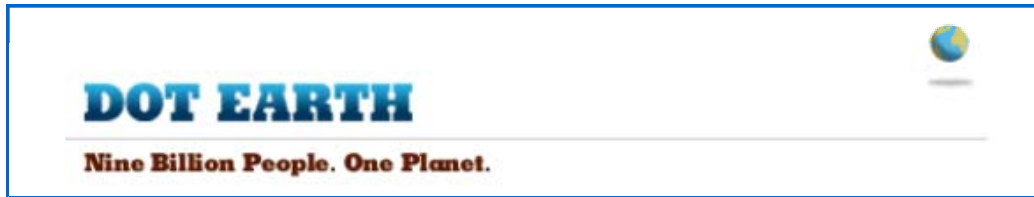
**The New York Times**

Friday, February 12, 2010

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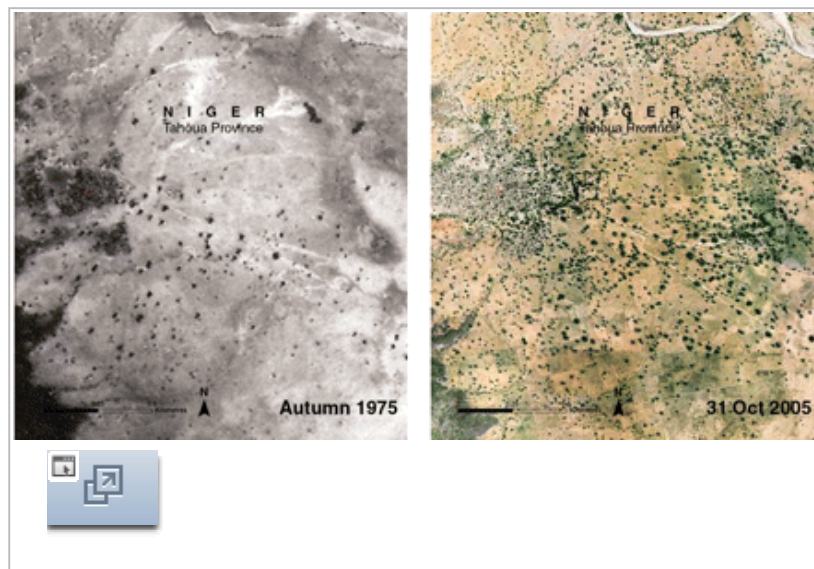
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February 11, 2010, 6:39 pm

## A Menu for Feeding 9 Billion

By [ANDREW C. REVKIN](#)



Science Magazine has removed the pay wall from [“Food Security: The Challenge of Feeding 9 Billion People.”](#) The paper concludes, as many have before, that keeping up with humanity’s needs as numbers and appetites crest toward mid-century poses big challenges. But it expresses optimism that a sustained focus on efficiency, technology and policy innovations can do the trick. (The images above, from the paper, show how [investments in water storage and other measures](#) helped restore vegetation in a dry region in Niger.) Here’s the summary:

Continuing population and consumption growth will mean that the global demand for food will increase for at least another 40 years. Growing competition for land, water, and energy, in addition to the overexploitation of fisheries, will affect our ability to produce food, as will the urgent requirement to reduce the impact of the food system on the environment. The effects of climate change are a further threat. But the world can produce more food and can ensure that it is used more efficiently and equitably. A multifaceted and linked global strategy is needed to ensure sustainable and equitable food security, different components of which are explored here.

The authors include [a menu of possible uses](#) for genetically modified crops, but stress that technology alone is far from sufficient if policies are not shifted to advance the appropriate use of the right agricultural strategy or tool in the right place. Over all, a focus on “sustainable intensification” of production of crops and livestock will be vital

to limiting impacts on remaining undeveloped ecosystems.

Aquaculture holds great promise, if practiced appropriately and efficiently, as does livestock production, the authors say, noting the reality that meat will long remain a part of most diets, particularly in populations moving out of poverty.

In the end, they say, one reality has to be a shift from simply boosting production to a new, interdisciplinary focus on getting the most food value with the least loss of land and other resources. The kicker?

[W]e must avoid the temptation to further sacrifice Earth's already hugely depleted biodiversity for easy gains in food production, not only because biodiversity provides many of the public goods on which mankind relies but also because we do not have the right to deprive future generations of its economic and cultural benefits. Together, these challenges amount to a perfect storm.

Navigating the storm will require a revolution in the social and natural sciences concerned with food production, as well as a breaking down of barriers between fields. The goal is no longer simply to maximize productivity, but to optimize across a far more complex landscape of production, environmental, and social justice outcomes.

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HIGHLIGHT ([what's this?](#))

[Scott W. Somerville](#)

Maryland

February 11th, 2010

6:01 pm

I've been looking into aquaculture lately. It's AMAZING what you can grow with tilapia, tanks, and pumps in a hot, dry climate. With a relatively modest amount of capital and reliable electricity one can a whole village with just a few acres. The water usage is amazingly low--with a sealed greenhouse, the only water you lose is in the food you eat!

The problem with feeding hungry people has a lot more to do with laws and customs than available acres. We have the technology and capital to make the desert bloom like a garden--but businesses don't want to spend money in places where the government is likely to expropriate their investments. The result is ever-increasing wealth in areas with the right cultural infrastructure, and ever-deepening poverty in places where the government promises to save the poor from "greedy capitalists."

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HIGHLIGHT ([what's this?](#))

[coddington.morton](#)

New Hampshire

February 11th, 2010

6:01 pm

Much arable land in Europe remains amongst the most productive on Earth. And Europe has yet to adopt GM crops! Imagine all of the additional food that will be available to feed the world once Europe catches up with modernity.

Over 1/4 of the US grain crop is burned as fuel on cars as a result of the green lobby having convinced the US congress that somehow this helps with the made-up CO2 crisis, as revealed by the US Department of Agriculture.

<http://www.guardian.co.uk...>

Imagine all the extra food that will become available for burgeoning African populations once the US government mandate to burn 1/4th of our cereal production in our cars is finally overturned.

There is no food crisis whatsoever, unless one subscribes to the same Malthusian church of worrywarts that the Club of Rome did in the 1970s. Or unless the environmental lobby comes up with more policies that take food from the bowls of Africans to burn it on people's Priuses as gasoline.

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HIGHLIGHT ([what's this?](#))

[George Mobus](#)

Tacoma, WA

February 11th, 2010

6:02 pm

One of the common features of scientific treatments of potential disaster scenarios is that the authors feel compelled to raise hopes of the reader. It usually follows the form: if only our leaders would wake up and do thus and so, we could avoid this particular disaster. Many, many writers reporting on global climate change and peak oil have followed this prescription in their books. After all, why would they write the book for an audience if they

didn't think that that audience would not actually do anything substantive - like vote for real change (that we can believe in).

William Catton wrote a book called Bottleneck that I reviewed on The Oil Drum and my own blog.

<http://www.theoil Drum.com/node/5954>

<http://questioneverything.typepad.com...>

In it he puts it very plainly. He is no longer going to follow that formula. He has struggled with the idea that "if only we'd change our behaviors we could avoid really bad stuff." In his first book, Overshoot, he detailed the problem with overpopulation and, to some degree, the over usage of resources by OECD citizens and how it was affecting our planet. In that book he used the formula because he felt we had time to correct our mistakes and save humanity. But in Bottleneck he suffers no such illusions.

We, as a species, and as individuals, had better learn to deal with truth and not try to whitewash it with the "if only we'd do..." caveat. The truth is that we do not do the ... things we needed to do twenty years ago to avoid catastrophe. Why try to sugar coat it?

Here is hoping you will see and report truth.

<http://questioneverything.typepad.com/>

George

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HIGHLIGHT ([what's this?](#))

[Mike Roddy](#)

Yucca Valley, Ca.

February 11th, 2010

6:03 pm

This critical challenge is well laid out here. I applaud the goal of resisting expansion of food production into scarce pristine areas, but there are traps.

Intensive livestock production, particularly pigs, has led to serious water pollution.

Fresh water aquaculture can be an excellent protein source if there is adequate stream replenishment, as in catfish grown in the Southeastern US. Saltwater shrimp and salmon farming has been much more destructive on many levels, including compromising local genetic stocks and massive disease outbreaks.

Monoculture softwood tree farming has not succeeded in increasing productivity, and has many terrible side effects (especially in steep areas in the Northwest). GMO tree farms also cause many problems, including aquifer depletion and loss of biodiversity. This isn't food production strictly speaking, but the challenge to produce adequate lumber is also daunting.

We have to be careful in redesigning food production, especially since the record of key companies such as Monsanto and Cargill has not been encouraging. Intensive agriculture, especially if it is supported by large amounts of fossil fuel and chemical inputs, should be viewed with great caution, and long term effects carefully studied.

We can't rely on the ag companies. Only well trained agricultural scientists working out of universities and independent NGO's should lead this effort.

Finally, all of these plans need to be made with global warming in mind, not only in evaluating future water and fertility, but in practices such as beef production and clearcutting's effects on our CO2 budget. How this is

administered and enforced will be the biggest challenge.

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5 .

[Dick Lawrence](#)

Hudson, MA

February 11th, 2010

6:03 pm

I wonder if the authors have factored in the near-certain and inconvenient fact that world petroleum production within 40 years will be substantially lower - down 50 to 65% - compared to present production. Yes, there are large deposits of tar sands in Alberta and in deep water offshore Brazil, but these will best-case only contribute a few million barrels a day, and will their output will be overwhelmed by the rate of depletion in the world's biggest fields. In addition, the work to exploit these unconventional sources of petroleum takes substantial energy itself, leaving less for 'everything else' - including agriculture.

Fertilizers and pesticide production also depends on fossil-fuel availability. Moreover, basic materials like phosphate (mined in just a few places in the world) are rapidly depleting the known recoverable reserves.

These facts should be paramount in considering where our food will come from in the next few decades. We should be planning for shortages of fossil fuels now - not waiting until it's a full-blown crisis.

Dick Lawrence

President, ASPO-USA

[www.aspo-usa.com](http://www.aspo-usa.com)

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6 .

[Andy Revkin](#)

Dot Earth blogger

February 11th, 2010

6:03 pm

Good question. I'll send them an email.

6 .

[Nick](#)

Portland, ME

February 11th, 2010

6:05 pm

Thanks, Andy. Often I refer back to a NYTimes article, and especially its supporting video, when discussing local, cheap solutions to land degradation and food security in areas prone to desertification:

<http://www.nytimes.com...>

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HIGHLIGHT ([what's this?](#))

[Dr. J. Singmaster](#)

94536

February 11th, 2010

6:06 pm

In many areas the growing of needed food crops is severely hampered by poor soil having little nutrients, especially nitrogen, for the crops to grow. I urge development of the nitrogen incorporating legume, Cajanus cajan, known as pigeon peas here, and gandules, gandur or toor in other regions of the world. The most important aspect of this legume is that it picks up higher levels of iron, an element often lacking in most crops, than most crops. Anemia is often a problem with many children in poorer countries getting fed mostly root crops, rice and dried beans.

It grows on very poor quality soils and can grow 2-3 times taller than soybeans to function as a windbreak. So it

can serve to prevent soil erosion as well as to help build up soil organic matter slowly.

The one problem with it is that various corn earworm species love the seeds. This problem can be eliminated if genetic engineering is done to get the *B. thuringiensis* (Bt) gene incorporated in it as has already been done with soybeans.

Someone should get the attention of one or more of the foundations, such as the Gates or Clinton ones concerned about food development in poorer countries, to fund incorporating the Bt gene in this crop and then distribute the seed to poorer countries. Grown in large amounts this legume could provide food for raising chickens as well. Dr. J. Singmaster

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8 .

[Chaotician](#)

NM

February 11th, 2010

6:09 pm

What idiocy! Humans have demonstrated repeatedly for millenniums that we are incapable of long range thinking regarding any actions needed to sustain our viral growth of the species. Only some worldwide viral epidemic, a natural disaster of planetary scope, or a man-made disaster will end the insanity known as modern man! We can hope that the remnants of man will be adaptive and self sustaining; but I would not want to make any bets that this economic animal will survive...would you?

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8

[Andy Revkin](#)

Dot Earth blogger

February 11th, 2010

6:09 pm

You're edging toward the stance of the voluntary human extinction movement. <http://www.vhemt.org/>  
Beware or Rush Limbaugh'll come after you like he did me... <http://j.mp/NPRonRush>

9 .

[Eva](#)

Mountain View, CA

February 11th, 2010

6:10 pm

Instead of wasting water on feed corn for cattle and biofuels, we could be using that same water to feed people. In the US west, it takes several thousand gallons of water to grow the corn needed to produce one gallon of corn ethanol, and hundreds of gallons of water to raise one pound of feedlot beef.

<http://pubs.acs.org...>

"The water requirements of biofuel production depend on the type of feedstock used and on geographic and climatic variables. Such factors must be considered to determine water requirements and identify critical scenarios and mitigation strategies. Feedstock cultivation, usually row-crop agriculture, is the most water-intensive of biofuel production stages. For example, evapotranspiration water requirements in the U.S. necessitate 500–4000 L of water to grow enough feedstock to produce 1 L of ethanol (Lw/Le) (Figure 1); processing water requirements for a typical sugar cane or corn ethanol refinery are only 2–10 Lw/Le (17). Nevertheless, the water used in biofuel processing and other stages in biofuel production is often withdrawn from local point sources and can have localized impacts on water quality and quantity."

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10 .

[Greenpa](#)

Minnesota

February 11th, 2010

7:02 pm

Not all scientists share this optimism. One factor glaringly missing from their cornucopian view is- humans. Their scenario calls for all kinds of cooperation and effective foresight, and enforcement of planning from the top down. I'm sorry; but "we hope everyone will behave nicely" just doesn't cut it.

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[11](#) .

[Justicia](#)

New York, NY

February 11th, 2010

7:02 pm

I am completely skeptical about the assertion that aquaculture is a net positive in terms of caloric energy returns on energy invested, particularly if the fish are fed plant based soy meals or, worse yet, fish meals.

We use fossil fuels in all aspects of our mechanized, industrialized agriculture -- including the fertilizers to replenish the soils we deplete and destroy, the pesticides and herbicides that are contaminating our freshwater. We are not only running out of oil but water as well. Water is fast becoming a limiting factor for both energy and food production.

Unlimited growth on a planet of finite resources is a fantasy. Unless and until economic analysis is grounded in biophysical reality, it's just humbug and nonsense.

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[Freespirit](#)

Chicago

February 11th, 2010

7:02 pm

Why isn't anyone talking about restricting the human population? Why should the world population explode to 9 billion? What people don't talk about is that as humans multiply, forests for wildlife disappear. So we'll have 9 billion humans, but no tigers, except in zoos. What a great world to live in! People like Bill Gates who donate money for life saving vaccines should also be required to distribute condoms and other birth control measures.

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[13](#) .

[coddington.morton](#)

New Hampshire

February 11th, 2010

7:03 pm

It is really fun to read the comments of the worrywarts. They actually think a Malthusian apocalypse is nigh! Sinners should repent, or else!

If only people such as Roddy, Lawrence, Singmaster and Chaoitcian knew how many times through the centuries doom, gloom, famine and resource exhaustion has been "predicted" by "experts". But familiarity with the pathetic historical record of the doom mongers seems to somehow evade their abilities.

"The earliest concern in regard to the dangers of resource depletion was related to forests and came during the Colonial period."

<http://www.jstor.org/pss/1818434>

We, of course, now have more trees in the USA than 130 years ago, and trees keep multiplying as they are wont to do... naturally...

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[14](#) .

[wmar](#)

usa

February 11th, 2010



7:03 pm

In following the California farming situation, I cannot help but wonder why desalination is not more freely employed.

I recall when the world responded to the Indonesian disaster of a few years ago, the US Navy was able to desalinate and filter hundreds of thousands of gallons of water each day (1 ship alone I believe).

If this would allow us to make better use of our farmlands, perhaps even allowing a less intensive use by opening up more area under irrigation, it seems this is all to the good. In addition, it sets up plentiful potable water should there be some other disruption in the water any area considers 'normal'.

Our pipeline technology would allow this unending stream of fresh clean water to go anywhere it was needed.

Best Wishes

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[15](#) .

HIGHLIGHT ([what's this?](#))

[boatsie](#)

beaming up

February 11th, 2010

7:04 pm

In the Thar Desert, day laborers pull a summer crop of mustard seed which will bring high prices for the landowner at the market. Without the assistance of a bore well, out of reach for many farmers, Rajasthanis depend on limited rainfall that usually only support one season of growing.

"I mean, you cannot meet a woman anywhere in the world and not be faced, again, with the fact that women are 70 percent of those who are the poorest in the world. And that's true, by the way, in the United States, again. Women are the majority of who's poor in this country, along with their dependent children."

So, I think we're going to have to make some real investments around how we see-- if we want to have these open, tolerant, stable, democratic societies. And that's the vision of the world that we have ahead of us." Ramdas, 2009.

"We have refocused strongly on food security, and by doing that we have to talk about the women who are producing the crops...the ones who manage household food security," says Annina Lubbock of the International Fund for Agricultural Development, one of the United Nations organizations that has been granted part of the donation. "We are talking about creating frameworks to recognize the role of small-holder agriculture, where women play an enormous role, as compared to commercial farms. This is key." link <http://www.mediaglobal.org...>

some interesting reading re hydroponics [www.rlc.fao.org...](http://www.rlc.fao.org...)

Simplified hydroponics: case study improving food security and nutrition-Ecuador.

Melanne Verveer, Ambassador-at-Large for Global Women's Issues, of the U.S. Department of State, singles out two international initiatives which are supporting rural women in managing agricultural production: Ethiopian women who are "administering a surveillance system to anticipate needs prior to drought and Liberian women, who are "quietly revolutionizing farming in response to increasing droughts."

Ethiopia's water statistics are undoubtedly the most shocking of all sub-Saharan Africa. More than 80 percent of Ethiopians live in the country's rural regions, where as few as 24 percent of the population enjoys safe accessible drinking water. Armies of women, with huge barrels lashed to their backs, line the roads early each morning and again in the afternoon, part of millions of women across the continent who on an average day walk four miles and carry 44 pounds of water back to their families. All too often, the water they return home with is contaminated

with disease.

"They walk all this way for water that may not be by any means safe or drinkable," said Meselech Seyoum of the Ethiopian NGO Water Action. "This really affects development in the country because there are so many other things could be focusing on instead of working so hard to secure water."

Sir Richard Jolly, head of a new United Nations campaign called WASH--Water, Sanitation and Hygiene for All, says that it is "women and girls who bear the brunt of the lack of clean water; it's women and girls who are intimidated and humiliated by the lack of sanitation." link: <http://www.womensenews.org...>

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[16](#) .

[Andy Revkin](#)

Dot Earth blogger, Reporter

February 11th, 2010

7:10 pm

Henry Miller, a research fellow at the Hoover Institution, sent the following by email:

The lengths people will go to avoid slaughtering sacred cows is remarkable. The views of these authors clearly demanded a condemnation of organic agriculture, whose low yields make it hugely wasteful of farmland and water, and whose practices -- in particular, the ban on genetically engineered plants -- prevent it from being amenable to no-till farming (which causes less soil erosion and emits less carbon dioxide than tilling for weed control).

The authors cite the need for consideration of "social justice outcomes," which are also disadvantaged by organic farming practices: Genetically engineered grains are less subject to contamination by toxic fungi and their toxins, which cause birth defects including spina bifida. Organic grains are especially prone to high levels of fungal toxins because the damage wrought to the plants by insects creates entry points for the fungi.

Any mention of organic agriculture is conspicuously absent from the article. I guess the authors didn't want to offend the likes of Alice Waters, Michael Pollan and Britain's Soil Association.

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By 2050 or so, the world population is expected to reach nine billion, essentially adding two Chinas to the number of people alive today. Those billions will be seeking food, water and other resources on a planet where, scientists say, humans are already shaping climate and the web of life. In Dot Earth, reporter Andrew C. Revkin examines efforts to balance human affairs with the planet's limits. Conceived in part with support from a John Simon Guggenheim Fellowship, Dot Earth tracks relevant news from suburbia to Siberia. The blog is an interactive exploration of trends and ideas with readers and experts. You can follow Mr. Revkin on [Twitter](#) and [Facebook](#).

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
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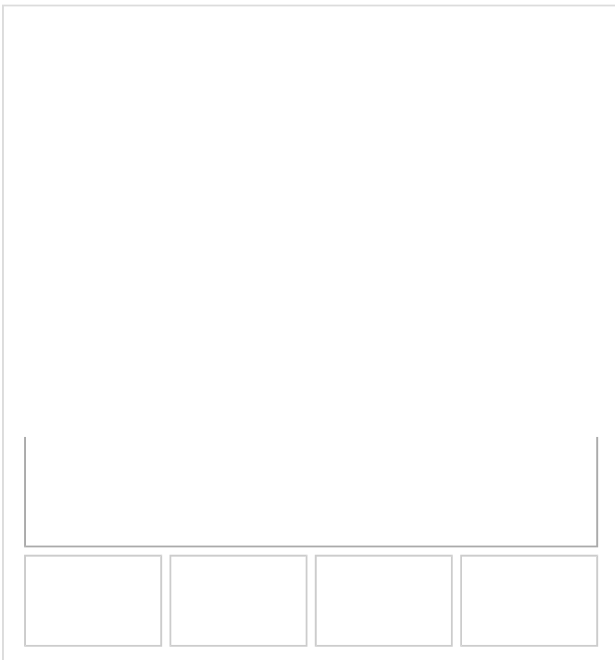


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- [GLOBAL WARMING](#) 442
- [CLIMATE CHANGE](#) 406
- [ENERGY](#) 185
- [CLIMATE](#) 139
- [SUSTAINABILITY](#) 123

- [POLITICS](#) 115
  - [GREENHOUSE GASES](#) 109
  - [MEDIA](#) 90
  - [CARBON DIOXIDE](#) 88
  - [OBAMA](#) 84
  - [ENVIRONMENTALISM](#) 83
  - [ARCTIC](#) 73
  - [OCEANS](#) 73
  - [ENVIRONMENT](#) 66
  - [POVERTY](#) 60
- 
- [CHINA](#) 60
  - [TECHNOLOGY](#) 58
  - [SKEPTICS](#) 55
  - [DISASTERS](#) 55
  - [SCIENCE](#) 49
  - [ECONOMICS](#) 48
  - [GLOBAL](#) 48
  - [POPULATION](#) 46
  - [COAL](#) 43
  - [OIL](#) 42
  - [DIPLOMACY](#) 41
  - [CONGRESS](#) 39
  - [BUSH](#) 39
  - [CONSERVATION](#) 37
  - [RESILIENCE](#) 35



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- [Jobs](#)
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