

gain (gān) v.
1. to improve; make progress; advance.
2. to get nearer, as in pursuit.
3. to acquire as an increase or addition: to gain resilience; to gain speed
4. to reach, especially by effort; get to; arrive at: to gain one's destination

gain (gān) n.
1. an increase
2. a measure of the increase in signal amplitude produced by an amplifier, expressed as the ratio of output to input.

GAIN

The right context for the 21st century



The Cuyahoga River caught fire in June 1969. — CLEVELAND STATE UNIVERSITY LIBRARY

by Joe S. Whitworth

The vocabulary of the modern environmental era has largely focused on the negative: the impacts that should be avoided; the extraction that must not occur; the species that should not go extinct. In some ways, it is the movement's most prominent feature — and quite striking for one founded on the idea that everything is connected. The time has come to shift the conversation, and effort, from one focused on environmental loss to one focused on environmental gain: from avoiding destruction to achieving restoration; from threatened to recovered; from weakened to resilient.

The negative of a picture

People understand big impacts — particularly when presented visually. After the heavily industrialized Cuyahoga River caught on fire and grabbed hold of the American psyche in 1969, outrage catalyzed significant environmental legislation in the early 1970s and spawned the first generation of environmentalists focused on finding and stopping bad things from happening.

But while big events capture our attention, the accumulation of smaller ones threatens our future. Addressing the biggest conservation issues of our time will mean trading in our “stop-loss” mentality for one seeking systemic environmental gain.

Recent events in the northern Gulf of Mexico, particularly when viewed in historical context, demonstrate the growing environmental consequences of wrong-scaled effort and significant implications for the path forward.

Just a drop in the bucket

On June 15, 2010, President Obama characterized the explosion on the Deepwater Horizon drilling rig and its resulting spill “the worst environmental disaster America has ever faced.” While the dramatic events monopolized media time and wrought significant economic difficulty on the region, the fact is, the oil spill was the least of that ecosystem’s problems.

The Mississippi River quietly drains the waters of 31 states into the Gulf of Mexico. Along for that ride are significant fertilizers, pesticides and excess nutrients from agricultural lands. Breaking the compounds down requires oxygen, but as nutrient levels have grown, their sheer scale simply overwhelms the ability of the system to stay in balance. With only fractional wetlands intact to help filter them out, the excess nutrients suck all available oxygen out of the system — known as hypoxia — stressing and killing fish and other aquatic species. Just as we would, the system chokes without oxygen.

In August 2010, the Louisiana Universities Marine Consortium reported the dead zone (low-oxygen or hypoxic zone) at the mouth of the Mississippi River extended for some 7,722 square miles, making it the fifth-biggest dead zone on record. If it were a state, the area would surpass the combined size of Rhode Island, Connecticut and the District of Columbia.

Recognizing a drop in an already toxic bucket when he sees one, Bloomberg *Businessweek’s* Peter Coy summed up the relation between the BP oil spill and the prospects of persistent conditions facing the Gulf, “it’s as if a gunshot victim recovered from a wound, then had to battle metastatic cancer.”

How did we get here? And perhaps more importantly, how do we get on the right track?

The arc of history frays at the far-end

Four decades ago, the most obvious problems for freshwater ecosystems emanated from industrial pipes, and this “point source pollution” became the target of unprecedented regulations under the Clean Water Act. Relatively easy to identify, enforcement on these sources by the new Environmental Protection Agency brought swift gains for aquatic health.

↓ The sediment-laden Mississippi River enters the blue water in the Gulf of Mexico creating an oxygen-depleted, or hypoxic zone. — NANCY RABALAIS/LOUISIANA UNIVERSITIES MARINE CONSORTIUM



With broad public support and case law mounting in favor of the early advocates, a starting position of “no” quickly became the default in most discussions of natural resource use — an impenetrable “Big Green Wall” put up as bulwark against the “Relentless Capitalist Affronts.”

Certainly this hard line developed in response to the long period of industrial over-reach, and practitioners refined and extended these tactics across the legal and physical landscape. Achieving balance meant shoving down hard on the environmental side of the scales that in the past had been accorded little to no weight. Today, through the vigorous effort of that first era of advocacy, most of the pollution from pipes has come under control.

In our zeal to “stop rivers from catching fire,” we developed an ability to identify, analyze and zero in on big impacts when it came to point source pollution. But we failed to effectively notice something else — runoff, which does not collect through a pipe. Called “non-point” sources (think “non-pipe”), this pollution rolls off our yards, our streets and our agricultural lands: tiny little bits of water often carrying extra chemicals. Billions of them every day make their way slowly through the hydrological cycle. Over time, these have accumulated to become the singular biggest water quality issue we face in the Gulf — and pretty much everywhere else.

Agriculture, though not the sole source of runoff, far and away represents its most significant contributor. During the same historical period as the first era of environmentalism, the agricultural side of the ledger saw innovation revamp farm operations. After World War II, advancements in technology simplified landscapes and put more ground under active cultivation. With fertilizer formulas becoming more sophisticated in the 1960s, farm productivity radically increased. Further — and perhaps most significantly — farm runoff was exempted from the Clean Water Act. This, along with increasing market pressures to get more and more bushels off each acre, drove a powerful cycle of intensified practices. And with one law-abiding-rational-economic-actor-farmer at a time doing the best he can over a period of years, we now find our freshwater, and many near-shore marine ecosystems, overwhelmingly out of balance. In fact, dead zones have been doubling each decade since 1960 — today, we have more than 400 around the globe. Indeed, according to a White House Office of Science and Technology Report released in September 2010, the impacts along the coast waters of the U.S. are more pronounced with incidents of hypoxia increasing nearly 30-fold since 1960.

The simple solution is obvious. We need to keep fertilizers out of the water. But doing that at a scale that matters will mean fundamental change — in culture, in economies, in politics and in environmental outlook. And while that seems a tall order, we have little choice but to accept the challenge.

Balancing scales

The domestication of plants and animals irrefutably stamps this planet as run by humans. We have long altered wild species and landscapes to make them more useful to us. It’s what we do, and is a primary reason our species gained and maintained dominance over the other inhabitants of the biosphere. As Jane Lubchenco, currently the National Oceanographic and Atmospheric Agency

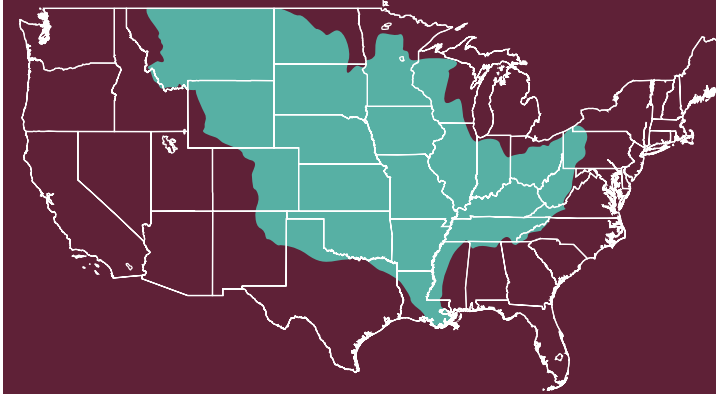
HYPOXIA 101

Hypoxia means low oxygen and is primarily a problem for estuaries and coastal waters. Caused mostly by excess nutrients — primarily nitrogen and phosphate — hypoxia promotes excess algae growth. As dead algae decompose, oxygen is consumed in the process. The resulting low levels of oxygen in the water ultimately decrease the amount of aquatic life in hypoxic areas — which explains why they are coined “dead zones.” A study in *Science* found that there are more than 400 dead zones in the world; the Gulf of Mexico dead zone is the largest in the U.S. and fifth largest globally.

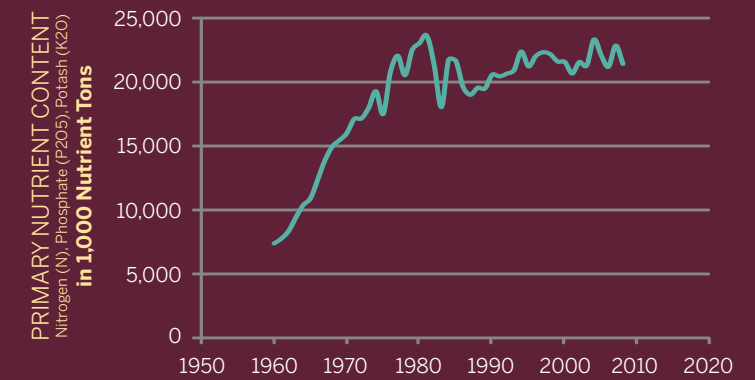
Adapted from the Environmental Protection Agency

MISSISSIPPI BASIN

Drains all or part of 31 states.



U.S. CONSUMPTION OF PLANT NUTRIENTS

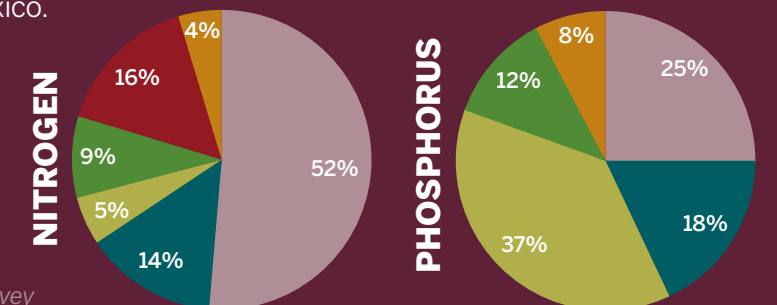


Adapted from ERS, Tennessee Valley Authority, Association of American Plant Food Control Officials, The Fertilizer Institute.

PERCENT CONTRIBUTION OF VARIOUS SOURCES OF NITROGEN AND PHOSPHORUS

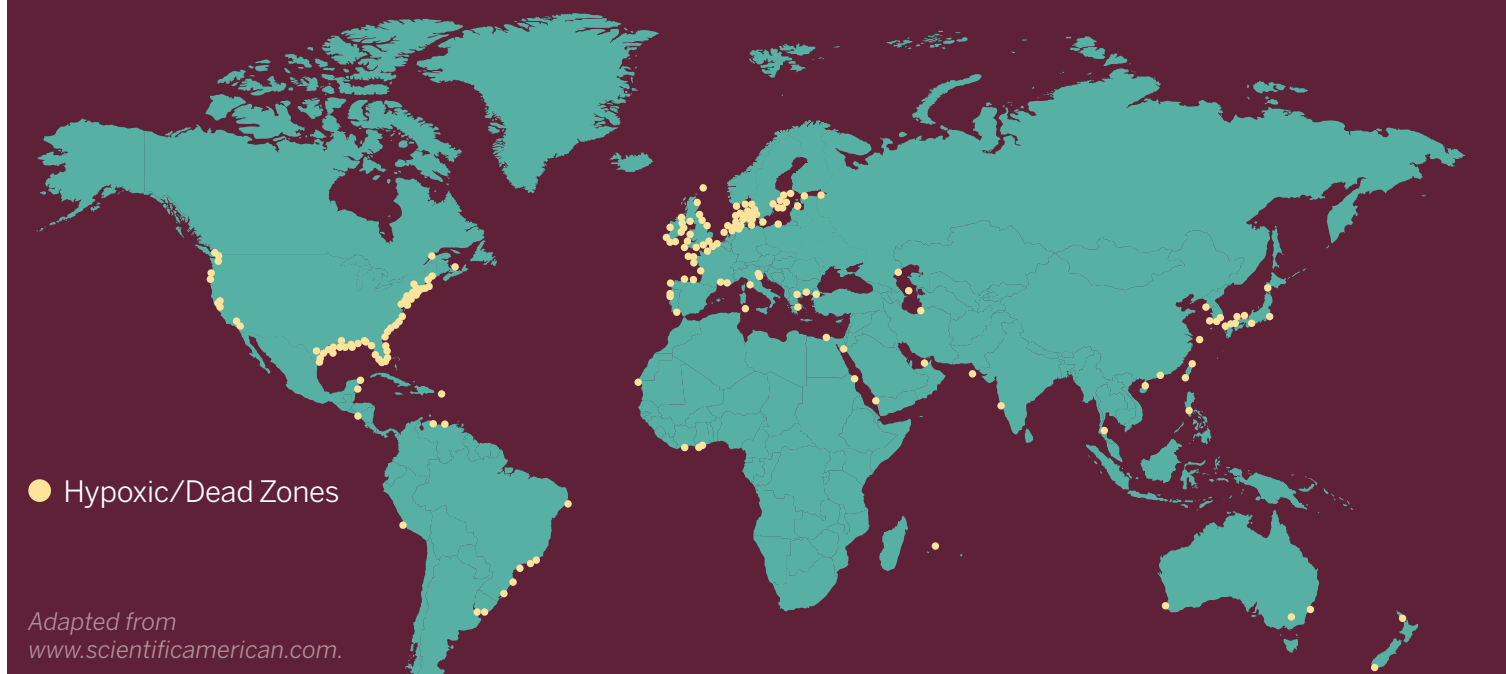
From the Mississippi River watershed to the Gulf of Mexico.

- Corn and soybean crops
- Other Crops
- Pasture and range
- Urban and population-related sources
- Atmospheric deposition
- Natural land



Adapted from U.S. Department of the Interior, U.S. Geological Survey

MARINE DEAD ZONES



● Hypoxic/Dead Zones
Adapted from www.scientificamerican.com.

Administrator, noted a decade ago, “Humans have emerged as a new force of nature. We are modifying physical, chemical, and biological systems in new ways, at faster rates and over larger spatial scales than ever recorded on earth.”

And what a force we are. According to the U.S. Census Bureau, population in the U.S. will grow from 300 million today to 440 million by 2050; globally, population will shoot from 6.9 billion today to 9 billion during the same time.

“Fundamental to making good choices is the ability to track results ecologically — to keep score in a new way.”

As Thomas Friedman underscores in his book *Hot, Flat, and Crowded*, if we welcomed each of the next billion newcomers to the planet with a 60 watt incandescent light bulb, it would take twenty new 500 megawatt power plants to turn them on for an hour a day. The implications for water and agriculture in a growing world are even more striking. For instance, in his noted work, *Globalization of Water*, Arjen Hoekstra calculated that it takes about 1,850 gallons of water to produce one pound of beef. As nations develop, their appetites move up the food chain. *The Economist* recently illustrated this using China as the example: the increase in beef consumption from 1985 to 2009 required additional water resources equivalent to all the annual water use in Europe.

There is no getting around the fact that humans will use resources — we have throughout history, and as populations inevitably grow the use will continue to pick up steam. To meet future needs will require a better understanding of the tradeoffs associated with those resource choices.

Keeping score

Historically, we have tracked environmental wins and losses in the courtroom. Environmentalists sue natural resources users to corral bad behavior — and certainly both sides keep score. As a result, our familiarity lies with the more traditional “us” versus “them” game that separates those that extract or use resources from those that conserve

CONSERVATION

TRADITIONAL

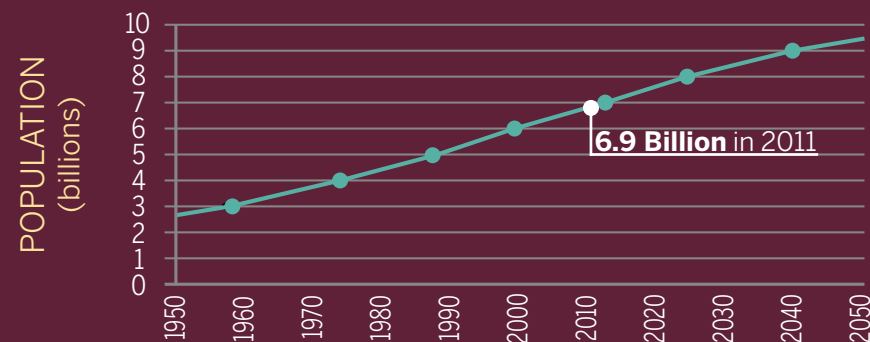
Problem-focused
Procedure-based
Defense-based
Advocacy/litigation oriented
Generalized good effort
Focused on winning battles

FOR GAIN

Solution-focused
Outcome-based
Action-oriented
Quantified results
Scalable, replicable
Focused on winning the war

WORLD POPULATION

FROM 1950 DATA TO 2050 PROJECTIONS



Adapted from U.S. Census Bureau, International Data Base, Dec. 2008 Update.

resources. And old fears die hard. At one extreme, agriculture and industry believe environmentalism is out to end their way of life. At the other, many greens possess a near genetic distrust of agriculture and industry, as they are part and parcel of the beast that put the Cuyahoga River ablaze and now choke the Gulf.

But in recent years, these stereotypes are starting to break down. Farmers and business owners dependent on natural resources for their livelihoods increasingly understand the importance of conserving

and restoring those resources; environmentalists increasingly view private landowners as central to meeting conservation objectives. Moreover, the binary

world with purely commercial enterprises on one end of the spectrum and purely social concerns on the other, with no overlap, has broken down as consumer sensibilities around everything from organics to investing has taken on a decidedly green hue.

Fundamental to making good choices by everyone is the ability to track results ecologically — to keep score in a new way. The conservation and scientific communities have not historically done an especially good job of quantifying the human benefits derived from nature — certainly not in any universal way. We have only just begun to quantify what constitutes a “unit of good” or a “unit of bad” that could be appropriately managed for net environmental gain.

An understanding of the strength of economics and its centrality to our existence was not lost on Wisconsin Senator Gaylord Nelson when he famously noted on the first Earth Day in 1970 that “the economy is a wholly owned subsidiary of the environment, not the other way around.” Although we all knew this, it remained largely an anecdotal truism. Of course humankind benefits from a multitude of resources and processes that are supplied by natural ecosystems. But this is far less romantic than the “Earth as Eden” view held by so many for so long — I mean, really, would you rather plant a tree for its aesthetic beauty and to hear the leaves rustle in the wind while you’re picnicking, or plant it to create bank stabilization, erosion control and reduction of solar gain in the riparian zone? We have begun to grasp the idea that landscapes are no longer special just for what they are (wetland area for solitude and spiritual renewal), but also what they do — the benefits they provide (wetland for sediment filtration and organic decomposition).

Collectively, these natural benefits are known as ecosystem services and include products like clean drinking water and processes such as the decomposition of wastes. These services and their definitions became more formalized by the United Nations 2004 Millennium Ecosystem Assessment, a four-year study involving more than 1,300 scientists worldwide. This research grouped ecosystem services into four basic categories: provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; and cultural, such as spiritual and recreational benefits.

In the late 1990s, research led by Robert Costanza was published in the journal *Nature*, which for the first time put an estimated dollar value on the essential services ecosystems provide as some \$33 trillion

FARM OF THE FUTURE

Ecosystem services — the natural benefits provided by healthy environments, such as high-functioning watersheds — have long been taken for granted. In the future, these services could generate half the income for a farm. Farms of the future may operate with diverse portfolios of traditional and conservation commodities.



annually. For perspective, that figure is several times larger than the capital commitment (to date) of U.S. taxpayers to our current bailout of the financial system, greater even than the inflation-adjusted cost of the Louisiana Purchase, the New Deal, the Marshall Plan, the Korean and Vietnam Wars, the S&L crisis and NASA’s moon shot combined.

Many have painted human activities as a grand experiment with an unknown outcome. As the world begins to see its resource limits on the horizon, it gets pretty easy to understand the punch line: unless we change course, we will end up where we are headed. In any case, there is no mistaking that we are now dealing with some massive, interlocking gears: ecological, financial and cultural. As Aldo Leopold noted, we are today wise enough to see that additional gears exist, without which human progress will not operate intelligently.

Scaling balance

From years of conflict we have come, but to years of innovation we must go. That means moving beyond old constructs. In looking at the sheer scale of the Gulf’s dead zone, one cannot deny the enormity of the economic engine and incentives that created it. But neither can one ignore that in some sense, all market-based decisions serve as proxies for our demands — we collectively chose this. Whether through disregard, denial or indifference, we chose that our agricultural impacts would completely dwarf the environmental efforts to better it. Aiding and abetting was an inaccurate accounting system that failed to internalize the consequences of our decisions. No values were assigned to the environment and thus, the choice was consequence-free, at least on paper.

Clearly, we need a new construct that allows us to make better choices. For the human and natural environment, this defines the great challenge of our time. Where an agricultural producer translates land into bushels of grain or pounds of beef, an environmental advocate translates land into a place of beauty that requires protection. There is no lingua franca between the two and thus no conversation between the players.

We need a new common language, because winning either argument wastes time on ego at a moment in history where we haven’t the time to waste. Inarguably, by focusing so heavily on stopping impacts rather than pursuing gains, we have a largely undeveloped capacity to balance the scales — to recognize that some impacts are unavoidable. We certainly all need to eat, so we need farms. But we also need to eat forever, so we need farms that can operate within a healthy ecosystem. To do this, we must break down hardened philosophical oppositions and distrust from decades of litigation, conflict and misunderstanding.

Only “we” can do this

Over the last half of the twentieth century, we took on the first big issue — pipes. Now we must move on to the next conservation chapter, one far more challenging as it will change our fundamental relationship with natural resources. Twenty-first century conservation must operate at the intersection of economics, ecology and politics, requiring new frameworks and skill sets that must be developed in short order. The engine of economics has shown to be the most muscular driver of change humankind has known. It can deliver far greater capacity than publicly-funded social enterprises, which are capital-starved and small in scale, and it can do it on an express timeline. The trick will be the proper engagement of increasingly accurate economic engines for the net benefit of the environment.

But it begins by committing to positive outcomes. As poet Wallace Stevens wrote, “After the final no, there comes a yes. And on that yes the future world depends. No was the night. Yes is this present sun.” We need to declare the outcome we are pursuing as one not of impact avoidance, but of recovery of natural systems and species — not to the exclusion of human activity, but in balance with it.

This is how we get the gain we need. 🌱

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