



Image: Tunnel of Love train track, Kleven, Ukraine.  
Credit: Flickr user [Reza Ahmeds](#) via Creative Commons.

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## The Mission(s) of *Science Chronicles*:

1. To bring you the latest and best thinking and debates in conservation and conservation science;
2. To keep you up to date on Conservancy science — announcements, publications, issues, arguments;
3. To have a bit of fun doing #1 and #2.

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## Peter Kareiva

# Marine Pollution and a World of Waste

By [Peter Kareiva](#), chief scientist, The Nature Conservancy



I was just revising the “marine chapter” for a textbook I have coauthored, and looking at reviews from professors who had taught a conservation course using our first edition. We were criticized for making marine conservation too much about fishing and marine protected areas, while neglecting ocean pollution as a big deal, and probably the greatest threat to our oceans.

It turns out these critics were right. For much of human history the ocean has been viewed as a place to dispose of waste where it would be so diluted that it does no harm. We now know better.

Dead zones, floating mats of plastics, and toxic chemical residues in marine fish tissue are striking evidence that human waste and by-products could be every bit as much of a threat to our oceans as over-fishing. Dead zones now affect more than 400 systems, and cover vast areas of the ocean — more than 475,000 square kilometers. Plastic debris in the oceans is now so common it is hard to find a beach without washed up plastics. This plastic is much more than a matter of aesthetics; all sea turtles, 45% of marine mammals, and 21% of seabird species are harmed by plastic.

The sheer volume of human waste products and the fact that most people live along coasts means that there will be no simple, single measure that can address marine pollution. Take something as specific as cigarette butts — over 4.5 trillion cigarette butts are discarded annually, and researchers have observed a 96-hour mortality effect (measured as LC-50) in larval topsmelt (a Pacific ocean silverside) at a dilution of one cigarette butt per liter of water. Latte-drinking enthusiasts in my hometown of Seattle have given rise to elevated caffeine concentrations in Puget Sound, which are known to

**Image: Tchotchkes from the Mystic Aquarium. Image credit: Flickr user [Rusty Clark](#) via a Creative Commons license.**

cause chemical stress in mussels and other marine invertebrates.

So what are we to do? There are solutions — but they are not things conservationists typically write about, or lobby for. Take plastic. Because it is so hard to eliminate the discarding of plastics, a better approach may well be the design and production of biodegradable plastics, which do not persist long in the ocean. Microbes have been genetically engineered to produce biodegradable plastics, and this new technology could be hugely beneficial to the world's oceans.

But bioplastics generated by GMO microbes will never be commonplace if certain environmental activists succeed in scaring the public away from all forms of genetic engineering. A less innovative approach entails investing in expensive tertiary treatment (when much of the world does not even have primary treatment of waste), and green chemistry approaches, which may be able to design less toxic or persistent compounds.

It should be feasible to generate political will for addressing marine pollution because doing so would benefit human health as well as biodiversity. Even low levels of mercury are so toxic to infants that curtailed fish consumption is advised in many countries due to the ubiquity of mercury in the environment. Again this is a problem that could be solved, since we know where mercury comes from and we know how to reduce its emissions. The problem is cost and tradeoffs. Mercury emissions from coal smoke are the primary anthropogenic source, but additional sources include some cosmetics, some pharmaceuticals, and dental products.

Conservationists talk a lot about consumption, and are well aware of the harm that can be done due to resource extraction. With greenhouse gases causing climate change, we also have a growing appreciation of the “emissions problem.” But the emissions problem is not just about greenhouse gases. Our tendency to discard and emit in huge volumes demands that we invest in new technologies that can solve the pollution problem. If we fail — all of the marine protected areas in the world will make no difference. **SC**

## References

Church, G and E. Regis. 2012. *Regeneis: How Synthetic Biology Will Reinvent Nature and Ourselves*. Basic Books.

Derraik, J. 2002. The pollution of marine environment by plastic debris. *Marine Pollution Bulletin* 44: 842-852.

Mearns, A. et al. 2012. Effects of pollution on marine organisms. *Water Env. Research* 84: 1737-1798.

Rochman et al. 2013. Classify plastic waste as hazardous. *Nature* 494:169-171.

Zahir, F. et al. 2005. Low does mercury toxicity and human health. *Env. Toxicology and Pharmacology*.

**“It should be feasible to generate political will for addressing marine pollution because doing so would benefit human health as well as biodiversity.”**

# Peter Kareiva, Craig Groves & Bob Lalasz Science for Nature & People (SNAP): A New Scientific Collaboration

By [Peter Kareiva](#), chief scientist, The Nature Conservancy; [Craig Groves](#), director, Conservation Methods and Learning; and [Bob Lalasz](#), director of science communications



How can protecting nature help secure food, energy and water for 9 billion people — including those who depend on natural resources for their daily survival?

That's a key question for today's conservation. And the need for science-based answers that will benefit all humankind is why we are excited to announce Science for Nature and People (SNAP), a new collaboration among The Nature Conservancy, the [Wildlife Conservation Society](#) (WCS) and the [National Center for Ecological Analysis and Synthesis](#) (NCEAS).

These three cornerstone organizations are launching SNAP this spring while seeking to add one or two new partner organizations from the humanitarian or development sector to extend our reach and expertise. In five years, our goal is for SNAP to become the go-to place for practitioners and policymakers from around the world to seek and find solutions to their most pressing problems around the conservation of nature and the promotion of human well-being.

**Image: Baby snapping turtle. Image credit: Flickr user [nouspique](#) via a Creative Commons license.**

Just as important, SNAP will provide the Conservancy, our partners and the conservation community as a whole with an agile, world-class R&D lab as we implement global solutions for the global challenges conservation faces.

### What Is SNAP? And Why Will It Have Real-World Impact?

SNAP will foster collaboration among scientists and practitioners who are focused on the nexus of sustaining nature and people. But SNAP is different than traditional think tanks or centers in academic institutions. It will focus on converting sound science into broadly adopted policies and practices:

- By integrating policymakers, funders and field practitioners from the start, SNAP will choose *action-oriented inquiries* and build constituencies with the motivation and resources to *turn the results of those investigations into action*.
- By generating knowledge that is science-based and practical, SNAP will ensure that sound science leads to *better policies and more effective field practices*, building durable economies that value nature's services and secure the livelihoods of communities at risk.
- By *delivering rapid, implementable answers* —within 18-24 months — SNAP will have maximum impact and relevance on industry, policy and conservation practice. We will publish results in peer-reviewed publications and make data and analyses available on the SNAP and NCEAS websites.

SNAP is also different from how we usually addresses conservation problems:

- First, SNAP will take an interdisciplinary approach to tackling conservation problems. The bulk of the inquiries will be conducted by working groups — the model NCEAS has used for more than 17 years to become one of the most influential scientific centers in the world. These working groups will tap not just scientists and expertise from the cornerstone organizations, but will draw heavily from external experts across a wide range of disciplines including academia, private industry, government agencies, and other NGOs. (See below for examples of working group topics.)
- Second, many working groups will involve a partnership of WCS and TNC scientists and conservation practitioners collaborating to solve conservation problems of global importance. Like TNC, WCS is a well-regarded global conservation organization with a strong network of scientists — which makes us ideal partners.

SNAP's ultimate output will be not just publications. Its working groups will cultivate case studies, analyses, syntheses and models that will be used to reform policies and scale-up best practices for conserving nature in ways that benefit people. Publication of results is important, but SNAP findings must have a defined pathway to implementing both conservation and human well-being outcomes.

**“SNAP will provide the Conservancy, our partners and the conservation community as a whole with an agile, world-class R&D lab...”**

SNAP is uniquely positioned to deliver results because its member organizations — TNC, WCS and NCEAS — collectively have thousands of staff members in more than 65 countries, providing the capacity to actively test conservation methods and strategies. Further, the members of this consortium have a proven track record of shepherding multidisciplinary teams to find answers to the planet's greatest challenges.

### **Launch, Governance and Funding**

SNAP will officially launch in spring 2013. The first three years of operation constitute the full launch phase. For the early initial launch phase (18-24 months), TNC's Peter Kareiva will serve as acting director, supported by Stephanie Hampton of NCEAS as managing director. Following an open search, the leadership role will transition to a full-time director.

To achieve maximum impact, SNAP will not be tethered to or branded as a "conservation NGO" enterprise. Instead, it will be an independent entity that combines academia, conservation NGOs and development institutions. All major management, strategy and resource allocation decisions are to be taken by an official governing board made up of one representative from each cornerstone institution (initially, Peter Kareiva, John Robinson from WCS, and Frank Davis from NCEAS).

In addition, there will be an advisory board of experts from the conservation, development, government and philanthropic sectors to help SNAP gauge the effectiveness of its early efforts and identify important questions, issues and opportunities for future working groups. This structure frees SNAP to be a global resource instead of simply the stepchild of any single organization. A leadership team of scientists as well as informatics and communications experts will be responsible for project management and day-to-day activities. The leadership team includes representatives from WCS, NCEAS and TNC. TNC members include Karen Poiani, Sanjayan, Craig Groves and Bob Lalasz.

SNAP has been generously funded through founding grants by Shirley and Harry Hagey, Steve and Roberta Denning, Ward W. Woods, Jr., Seth Neiman and the Gordon and Betty Moore Foundation.

Following the membership fee model of the Conservation Measures Partnership and the Natural Capital Project, each member organization will be expected to contribute \$100,000 each year to help offset SNAP's basic operating costs and to prioritize SNAP within their fundraising strategies. This approach to fundraising should provide SNAP with the necessary initial funding to permit it to become an enduring and self-sustaining scientific entity.

### **SNAP and TNC**

SNAP presents a great opportunity for Conservancy scientists to work with other world-class colleagues in providing real-world solutions to some of conservation's most

**"This structure frees SNAP to be a global resource instead of simply the stepchild of any single organization."**

critical problems and challenges. A few TNC scientists have already had the experience of serving on NCEAS working groups. An important goal of SNAP is to provide conservation scientists and practitioners from TNC's field programs with a professional development experience that will address a globally significant conservation problem and promote their career advancement as well. In addition, participants in the new [NatureNet Fellowships program](#) may be detailed to SNAP working groups.

Conservancy scientists are encouraged to develop ideas for working groups and to approach SNAP leadership team members with their proposals, although there will also be a more formal RFP process available soon on SNAP's website. Ideas for working groups should consider the following criteria:

- 1) A substantial knowledge gap exists related to a significant conservation problem;
- 2) Solving the problem will generate or lead to biodiversity conservation and human well-being outcomes;
- 3) Data exist that a working group can use to help address the problem;
- 4) The problem or issues are ripe for tackling — decision-makers or policymakers are primed for uptake of findings on these issues;
- 5) The problem is at a significant scale to be relevant to other conservation practitioners; and
- 6) The topic is potentially an exciting and compelling one to donors and stakeholders.

See below for some of the early working group concepts. To learn more about the collaboration and how to propose working group ideas or participate in working groups, contact any one of SNAP's TNC leadership team members.

### **A Look at Early Issues SNAP Will Tackle**

SNAP will tackle high-profile problems where the sought-after solution has a clear pathway to practice. We are interested in conservation questions whose answers will also impact the poorest of the poor, supply chains, resource extraction systems, and economic development in general. Here are some examples:

#### *Conserving Western Amazonia's Freshwater Ecosystems & Services*

The Amazon Basin is the largest river system in the world, and the Western Amazon contains the largest areas of flooded forests, floodplain lakes, and other wetlands in the Basin. These rivers and floodplains are important to livelihoods; to iconic fish that migrate thousands of miles from the mouth of the Amazon to its Andean headwater streams; as critical sources of high-protein food (fish, caimans and turtles); for a vast inland transportation network; and as drinking water for rural populations and growing cities.

Large-scale infrastructure development — including hydroelectric dams, roads and pipelines — is already impacting the Western Amazon, and more installations are

**“We are interested in conservation questions whose answers will also impact the poorest of the poor, supply chains, resource extraction systems, and economic development in general.”**



planned. Aquatic ecosystems will increasingly be impacted by changes in the hydrological cycle caused by dam projects, by upland and floodplain deforestation associated with land conversion to farming and ranching, and by climate change.

The vast size of the Amazon Basin and the interlocking relationships among the ecological systems and processes involved suggest that conservation actions must be informed by scientific analysis and synthesis of information at large enough scales as to be capable of capturing these ecological complexities. The rapid expansion of energy infrastructure and urbanization in the Amazon, coupled with greater frequency of extreme hydrological events, means that integrated river basin management has become critical to inform a balanced conservation and development strategy. A SNAP working group will address five critical questions to provide the scientific analyses and syntheses that will be the foundation of this integrated management:

- Where are the highest value conservation areas for migratory fish?
- What hydrological and limnological changes can be expected to impact the Amazon River as a result of planned dams?
- How will climate change affect the seasonal flood and drought cycle of the Amazon?
- How will human livelihoods be impacted by changes in water quality, water quantity, and fish availability caused by climate change and/or the development of upstream dams?
- What policy and management recommendations result from answering these questions?

#### *Coastal Defenses – Helping Nature Protect Our Shorelines from Hazards*

Coastal hazards are increasing significantly around the world, putting more and more people and property at risk. In 2011, insured losses from natural disasters (especially storms and flooding) reached an all-time high, and impacts will continue to worsen with coastal development and climate change. Billions of dollars are moving to reduce risks from disasters and climate change, creating both threats and opportunities for natural systems. Those funds are destined for “grey infrastructure” such as seawalls. We can turn this threat into an opportunity by including coastal ecosystems as part of the solution for reducing socioeconomic vulnerability to coastal hazards.

Decision-makers — especially post-Hurricane Sandy — recognize that coastal habitats have a role to play. But they are rightly asking (i) how important are these benefits, (ii) where and how should we restore them, and (iii) how do we create incentives to reduce risks and conserve coastal habitat.

A SNAP working group composed of leaders from coastal engineering, re-insurance, conservation, aid and development groups will address these problems head-on. They will provide practical guidance on when, where and how investments in green(er) infrastructure are cost-effective and help motivate financial incentives that reduce risks to both people and nature.

**“Billions of dollars are moving to reduce risks from disasters and climate change, creating both threats and opportunities for natural systems.”**

### *Opportunities for Increasing Agricultural Productivity with Nature's Services while Insuring that Local People Benefit*

Agricultural productivity must be increased by at least 50% in the next two decades to meet the world's demand for food. This demand potentially conflicts with the need for preserving land for nature, especially in biodiversity-rich tropical countries. It is also unclear whether many of the proposed approaches to increasing agricultural productivity enhance in-country food security, since in many cases external investors buy land and run large operations for export. There is a need not just to examine agricultural strategies that simply pay attention to boosting total yields, but also to examine those strategies that consider agriculture's impacts on local poverty and local ecosystems.

Representatives from agribusiness and biotechnology, poverty alleviation NGOs, [CGIAR](#) and conservationists within TNC and WCS will conduct a series of case studies that test hypotheses about the outcome of different pathways to agricultural intensification. For example: What are the differences between small landholder farming and big business farming? We will track outcomes including income, impacts on ecosystem services, agricultural productivity, and where the agricultural production is ultimately consumed.

#### **What Will SNAP Look Like in 2020?**

SNAP is designed to become the Bell Labs of conservation and sustainability science — noted for innovative, timely and credible scientific answers to the most pressing questions about the links between nature protection and human prosperity.

For policy debates with rapidly approaching deadlines, SNAP will be the go-to institution, much like the National Academy of Science is the go-to institution for longer time frame science and policy assessments. However, unlike the National Academy, SNAP will address international as well as domestic issues. Although not all of SNAP's inquiries will focus on Conservancy priority landscapes or topics — after all, SNAP is a true collaboration — we expect its findings to be of significant utility to TNC and WCS as they tackle global challenges to conservation in a rapidly changing world.

Sticky communications will be critical for SNAP's success. Key communications goals include: 1) achieving broad awareness of our findings among decision makers who have a substantial stake in the questions we ask, and 2) increasing public awareness of the potential of "conservation for people" to help secure a sustainable future. At all times, SNAP will ensure that its work resonates in the lives of the general public.

For questions about SNAP, please contact [pkareiva@tnc.org](mailto:pkareiva@tnc.org) or any of the TNC leadership members. To learn more about NCEAS, please visit [www.nceas.ucsb.edu](http://www.nceas.ucsb.edu). **SC**

**“SNAP is designed to become the Bell Labs of conservation and sustainability science — noted for innovative, timely and credible scientific answers to the most pressing questions about the links between nature protection and human prosperity.”**

## Article

# What 7 Years of Compliance Monitoring Tell Us About the Future of Our Conservation Easements

By [David Fox](#), easement manager, The Nature Conservancy in Virginia; [Jensen Montambault](#), applied conservation scientist, Central Science; and [Lynn Lozier](#), Conservation Track program director, The Nature Conservancy in California



The Nature Conservancy (TNC) has invested big in easements as a strategic tool. As of the end of 2012, we held 2,367 easements, protecting 2.8 million acres of land in the United States<sup>1</sup> alone. This follows the national trend where more land trusts are choosing what on the front-end seems like the cheaper option to secure an easement rather than purchasing the land outright (Figure 1).

The seasoned conservationist in all of us, however, knows that there is no such thing as a free ride. In order to ensure that our rights are maintained, TNC spent nearly 23,000 staff and volunteer hours monitoring and defending easements for a total cost of US \$1.07 million in 2012.

Why are we willing to invest like this to provide regular and systematic monitoring per our SOP? It is because each conservation easement is a package of perpetual rights and restrictions negotiated between TNC and the person or entity who continues to own and manage the land. We have a vested interest in their staying power and in understanding their ongoing costs and risks.

**Image: Owners of a ranch under TNC conservation easement in California. Properties with conservation easements will change hands over time, either to new generations or to unrelated successor owners. Credit: Felix Rigau.**

But what could go wrong? Documents have been signed; champagne corks have popped! All that is left is to settle in for a mere eternity of complacent compliance. Yet, we know things do go wrong. One of the major ongoing costs of holding conservation easements is identifying and dealing with compliance problems, situations where actions on the land have diverged from the legal restrictions we have in the easement language.

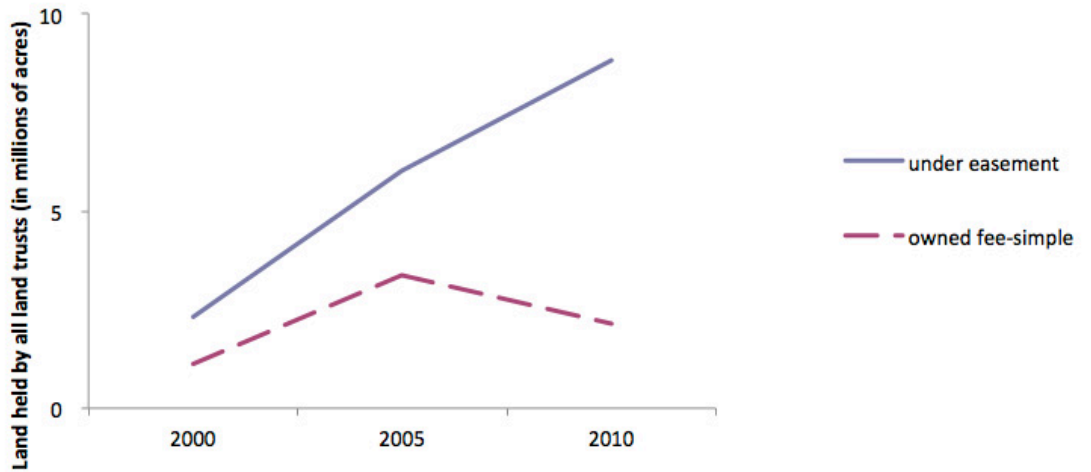
These compliance problems cover a wide range:

- **Administrative:** A landowner makes a change anticipated in the easement, (e.g. a new barn or driveway construction), but forgets the requirement to run the siting details by TNC first. It could be OK, or put in the wrong place, could be more serious.
- **Recoverable:** For example, a landowner cuts back natural shrublands to “pretty-up the place.” A situation like this may recover naturally or active restoration may be required.
- **Lasting and serious impacts to conservation values:** Such as construction in a sensitive wetland. Addressing this could involve very significant costs.

“One of the major ongoing costs of holding conservation easements is identifying and dealing with compliance problems, situations where actions on the land have diverged from the legal restrictions we have in the easement language.”

**Figure 1: Distribution of conservation lands in the United States**

*Data Source: Land Trust Alliance census (www.landtrustalliance.org)*



Because we are legally and ethically obligated to enforce and uphold conservation easement terms, compliance issues represent a significant risk to staff time and financial resources. Many compliance issues can be resolved amicably with a minimum of staff time or financial resources, but using the courts to resolve a dispute about an easement, which is our ultimate recourse, can be hideously expensive and time consuming.

Costs of TNC legal fees were not available for this assessment since TNC does not track the cost of legal expenses associated with individual compliance problems, but instead captures all monitoring and enforcement costs together. However, the average costs for all land trusts of resolving a serious dispute is reported to be around US\$50,000 with some cases running costs over US\$0.5 million and remaining unresolved (Betterly 2008). With the potential to put these kinds of resources on the line, it is critical that we

understand the conditions that may contribute to compliance problems and the long-term risks and costs associated with protecting these conservation investments into the future.

In order to better understand the conditions that may lead to these compliance problems, we examined the compliance monitoring records of all the easements held by TNC from the time our easement policies were standardized nation-wide in 2005 through 2011. The purpose of the study was to assess whether there is a trend over time in the rate of compliance and examine whether the following attributes of easements correlate with these compliance problems: size (acres), original fair-market value of the property (in U.S. dollars adjusted to 2011 equivalent) and whether the easement was under original or successor<sup>2</sup> ownership at the time of monitoring.

Under TNC’s Conservation Easement SOP, we monitor annually and categorize the status of every easement as either i) in compliance, ii) in violation of its legal terms, or iii) under review when information is still being gathered or a reasonable resolution is already underway and being tracked. It is our practical experience that there are some situations that can cause an easement to be reported as “in violation” yet may be resolved quickly and cheaply. In contrast, some situations that come “under review” can be costly and time-consuming to resolve. Thus, the only clear and systematic state is when an easement is “in compliance” and no further investment of TNC’s time or money is required. For this reason, we simply identified how often easement status deviated from “in compliance.”

We found two important trends in the data set<sup>3</sup> and share two insights pertinent to field programs holding easements.

**Trend # 1: The proportion of easements in compliance with their terms increased steadily over the 7 years of the study period.**

We are very encouraged that over time the proportion of easements in compliance has increased steadily (Table 1). It is probable that the lower rate of compliance in 2005 represents, to some extent, the “back log” of ongoing compliance issues that had developed during the time in which we did not have clear policies on monitoring and enforcement, but the increasing trend appears to persist after this point.

“... the average costs for all land trusts of resolving a serious dispute is around US\$50,000 with some cases running costs over US\$0.5 million...”

**Table 1. Trend in proportion of TNC easements in compliance over the 7 years of this study.**

Monitoring Year	2005	2006	2007	2008	2009	2010	2011
Number of easements held by TNC	1444	1584	1740	1922	2064	2169	2352
% of TNC’s easements “in compliance”	92%	95%	95%	96%	96%	96%	97%

**Trend #2: Successor landowners were more frequently out of compliance with the terms of easements than original landowners.**

While we found no correlations between the size of eased properties or their financial value and their compliance status, there were differences related to ownership. We found 12% of easements that remained in their current ownership during the study period had compliance issues, compared to 17% of those that moved to successor owners. What this difference translates into for stewardship and conservation easement defense budgets could be nominal for most chapters.

For the 35 states that hold fewer than 50 easements, this could translate to 2-4 additional compliance problems in the course of 10 years. For the several TNC state chapters that hold more than 150 easements, these extra costs could be more substantial. Regardless of the size of the program, we need to acknowledge that almost all easements eventually will move into this higher risk successor owner category. We should be aware of the risks posed by successor owners and take steps to ensure a smooth transition: ensure that the new owners are aware of the easement, understand TNC’s reasons for holding it, and get the opportunity to ask questions and begin a relationship with our staff.

**Insight #1: The magnitude of easement holdings and the ensuing potential risk associated with the volatile costs of easement defense and resolution must be considered and planned for.**

The over 2,300 TNC conservation easements are dispersed unevenly across the country: Eight states hold 100 easements or more while Colorado, Virginia and Wyoming hold more than 150 each (Figure 2). On the other hand, half of TNC’s state programs hold 25 or fewer easements. This study is neither a prescription for use nor condemnation of conservation easements. However, all state programs using easements as a strategic tool should be cognizant of the continued costs and risks associated with them, along with their benefits.

“We found no correlations between the size of eased properties or their financial value and their compliance status.”

**Figure 2: Top ten states ranked by number of TNC easements**  
*Represents 57% of all TNC easements in the US. Data source: McPeck et al. 2012*



**Insight #2: Regular and standardized in-person monitoring of conservation easements also functions as an outreach tool to forge a better relationship with and improve the stewardship awareness and activity of the people directly engaged with conservation on the land they own and manage.**

We believe that this pattern of improving compliance over the last 7 years is a result of our new (as of 2005) standardized easement monitoring policy. Regular in-person monitoring gives TNC and landowners an opportunity to discuss, resolve or anticipate and avoid situations that might otherwise lead to compliance issues. Regular monitoring also reinforces a perception of vigilance; landowners may be less likely to engage in activities they know may be prohibited if they expect that TNC will inspect the property on a regular basis. Regular monitoring has been demonstrated to serve both enforcement and outreach functions in other conservation systems, such as community-based marine conservation areas (Mangubhai et al. 2011). Our hypothesis is that interactions with landowners are just as important as the physical inspection of the property, and may be doubly powerful when they happen together.

As with any land conservation strategy, conservation easements have significant financial implications, the bulk of which may come years after the initial “win” of protecting the property. We need to be realistic in our expectations and acknowledge that most easements will someday have some kind of compliance issue. As perpetual rights and restrictions that run with the land, almost all easements (excepting those on land owned by public entities or other perpetual trusts), will eventually be owned by people other than those who initially benefited from either the altruistic or financial motives creating the easement.

Therefore, we can have no illusions about the staff and financial commitments required to make this valuable conservation tool work in perpetuity. Easements require knowledgeable people on the ground, interacting positively with landowners, new and old alike, to reduce the likelihood of problems and to improve the chances that when problems do arise they can be reasonably addressed and resolved. While we should seek potential cost efficiencies in monitoring easements, such as more extensive use of remote sensing imagery, we should be wary of reducing landowner contact, which likely plays a significant role in our high and improving compliance rates. We also need the financial resources to support robust, regular in-person monitoring. They are critical to TNC’s ability to adequately go to the mat to defend our conservation investments. **SC**

#### Notes

<sup>1</sup> While The Nature Conservancy does hold easements in several countries besides the United States, this assessment focuses on the easements held in the United States.

<sup>2</sup> The Land Trust Alliance defines a “successor landowner” as “an owner who acquired protected property, not the original grantor of the conservation easement.” There is much anecdotal evidence suggesting that successor land-owners may be more likely to have compliance problems, but, as far as we know, this is the first quantitative assessment of this issue over a broad geographic scope.

<sup>3</sup> Details of the analysis and statistical results are in a manuscript by Montambault and Fox currently under review for publication. A recorded presentation of methods and preliminary results of this analysis can be viewed at: [www.conservationgateway.org/Pages/scifest-montambault](http://www.conservationgateway.org/Pages/scifest-montambault).

**“Regular in-person monitoring gives TNC and landowners an opportunity to discuss, resolve or anticipate and avoid situations that might otherwise lead to compliance issues.”**

## References

Bates, S. 2007. Conservation capacity and enforcement capacity. Land Trust Alliance, Washington, DC.

Betterly, R. S. 2008. Land Trust Alliance conservation defense fund: an analysis of historic data relating to easement violations, land protection and defense insurance feasibility. Betterly Risk Consultants, Sterling, Massachusetts.

Bouplon, R. J., B. Lind, and L. T. Alliance. 2008. Conservation easement stewardship. Land Trust Alliance, Washington, DC.

McPeck, B., M. Burget, J. Williams, et al. 2012. [Land management in TNC today: Internal discussion paper, June 12, 2012](#). Downloaded: February 21, 2013.

Mangubhai, S., M. Saleh, Suprayitno, A. Muljadi, Purwanto, K. L. Rhodes, and K. Tjandra. 2011. Do not stop: the importance of seamless monitoring and enforcement in an Indonesian marine protected area. *Journal of Marine Biology* 2011:501465.



# Tim Tear & Geoff Lipsett-Moore

## Out of the Trees and Onto the Plains: Evolving Carbon Credits for the Future by Looking to the Past

By [Tim Tear](#), director of conservation science, New York and Africa; and [Geoff Lipsett-Moore](#), Northern Australia program director, The Nature Conservancy



Approximately 4 million years ago in what is now central Tanzania in East Africa, there is evidence that a few primates living in forests decided to brave the predators of the open rangeland in search of food. That decision resulted in one of the more important events in evolutionary history — the primates began to walk upright on two legs as opposed to all four.

The evidence of this transition is captured in a place called Laetoli on the slopes of Ngorongoro Crater — where one day 4 million years later a few anthropologists having some fun on a lunch break throwing dried elephant dung at each other literally stumbled across something special: footprints on a rock. Detailed archaeological investigations later revealed what we know about these footprints today. They were left by a mother and child walking across a mudflat. Shortly thereafter their tracks were covered in ash from a nearby erupting Rift Valley volcano where the footprints were sealed in time until present day.

**Image: Aerial view of a controlled burn of savanna woodlands on Fish River Station in Australia's Northern Territory. Image credit: Ted Wood.**

What does this have to do with carbon? While sure to be less profound than the Laetoli footprint story, the tale of carbon credits is one of evolving ideas, taking risks, and venturing onto the open plains in search for new horizons. It is a story of places where mankind began, in Africa and in Australia. It is a story that involves mankind's first use of tools such as fire and livestock. But perhaps most importantly, it is a story of hope.

### **Carbon Markets: Not Quite Dead Yet, and Not Just About Forests**

Over the past several years in the United States there has been a shroud over talking about climate change, and reliance on conventional wisdom that wanted to declare that the carbon market is dead. Outside the United States, however, successes with [REDD \(Reduced Emissions from Deforestation and Degradation\)](#) forest carbon projects exist — standing testimony that carbon sequestration from conservation actions is not only a viable conservation concept, but worthy of payment as a global good. Tenacity and innovation are starting to reap benefits in this conservation strategy after having been muted by the complexities of international politics, the realities of implementation, and the battle scars of going first. Payments for carbon-based ecosystem services are starting to go well beyond conserving forests to capture more carbon.

In the Conservancy, there are two places where the concepts of carbon sequestration and reducing emissions have come down out of the trees and ventured out into the dangers of the open savanna. Both projects are found where some of our oldest known peoples can be traced: to lands of the Aboriginal Australians and the pastoral tribes of East Africa.

### **Establishing an Indigenous Carbon Economy Down Under**

In Australia, the concept of “avoided emissions” from habitat degradation borne in the forest is now evolving right before our eyes. Fire — once the most important tool in the Aboriginal tool box — has again emerged with catalytic impact. In this modern day context, fire is valued not for cooking, protection from predators, or for warmth, but for preventing more catastrophic, greenhouse-gas-producing, late season wild fires in grassland and savanna ecosystems. The concept is simple — if actions can be taken to reverse a persistent trend of late dry season wildfires by strategically setting early dry season cool burning fires, then we avoid higher green house gas emissions. This work has value not only to local people and nature, but also to the global community that is willing to pay for it.

In this Australian case, the Conservancy is working with key partners — The Northern Australia Indigenous Land and Sea Management Alliance (NAISMA) and the Indigenous Land Corporation (ILC) to establish a robust business model to enable the emergence of an indigenous carbon economy. This economy will support traditional owners living and working across Northern Australia. Working with the ILC, Fish River Station is our proof-of-concept project and the first approved savanna fire abatement project in the country under [Australia's Carbon Farming Initiative](#).

**“While sure to be less profound than the Laetoli footprint story, the tale of carbon credits is one of evolving ideas, taking risks, and venturing to the open plains for new horizons.”**

Beyond this site, we are in the process of dramatically expanding the savanna burning approach with key Indigenous groups in the Kimberley, Northern Territory and Cape York regions. To support this growth, we are helping to build the institutional arrangements to manage the carbon transactions for the Indigenous groups through the establishment of an independent entity called the Northern Indigenous Environmental Services Ltd (NIES). We are also working with NAILSMA, other Land Councils, and many local communities to help raise awareness, build capacity, establish and strengthen governance and institutional arrangements. We view this as necessary to secure enduring land management and carbon projects necessary to ultimately provide biodiversity, social and cultural benefits. Finally, we are in the process of developing new methodologies to [expand and consolidate the emerging carbon economy](#).

The Government of Australia has spoken loudly and clearly that it values this work — to the tune of \$23 per ton of carbon dioxide equivalents (CO<sub>2</sub>e). When carbon credits from savanna burning projects are sold, there will be enough to pay for the fire program and the Indigenous ranger jobs that support it.

### **Back to Real Grass Roots: Valuing Carbon in the Soil in East Africa**

Meanwhile, in East Africa, a similar model is being developed. In this case, the Conservancy is investigating the potential for using livestock to improve degraded rangelands and [put more carbon in the soil](#). While most carbon projects focus on avoided loss or sequestering more carbon above ground, this project is looking at the value of putting carbon back into the soil. Building on a partnership with the Northern Rangelands Trust, the hope is to rely on their “grass roots” local governance structures built over the past decade to change existing nomadic grazing practices to put more carbon in the soil. The plan again is simple — to do this by literally improving the grass (and its roots) that both [wildlife and livestock rely on](#).

One of the critical aspects of this approach is the apparent appeal it has to individual pastoralists. In just the first two years of this program, the new grazing management system is already resulting in healthier livestock and healthier grass. In a biogeochemical context, increasing soil carbon helps to increase water retention and nutrient cycling. To a pastoralist, these complex processes are simply easy to see: grass stays greener longer. Soil carbon is also an important indicator of resilience: soil with more carbon allows grasses to withstand drought better and bounce back from drought faster.

The slow ecological processes that result in changing soil carbon levels present a fascinating indicator of longer-term change. In conservation’s quest for better measures, below ground indicators help to dampen or remove a great deal of “noise” from variability in many climate measurements gathered above ground in days, months, seasons, and even years. In short, because soil carbon is slow to change, it provides a signal that is relatively easy to interpret.

Just like in Australia, in Northern Kenya we are testing the premise that a viable carbon project could pay for the critical conservation work needed to reverse decades of rangeland degradation. Instead of improving fire management as the agent of change,

**“The slow ecological processes that result in changing soil carbon levels present a fascinating indicator of longer-term change.”**

livestock are managed better. And when livestock management is improved, it effectively converts livestock from being the cause of habitat degradation to being the cure. Currently trading at \$6-12 a ton CO<sub>2</sub>e on the voluntary market, early estimates suggest there will be enough revenue to pay for sustaining the grazing management program and generate a surplus that could be returned directly to the pastoral communities that ultimately determine the fate of this vast landscape.

### **The Path Ahead: Lessons from the Plains to the Primordial Seas?**

It is not a crazy coincidence that the very mechanisms that predict the role of grazing and fire to changes in soil carbon evolved from decades of long-term research on the Serengeti plains. These plains were born from the volcanoes that covered the Laetoli footprints. These plains supported people and vast migrations of herbivores for millennia — which is exactly why ecologists have studied them, and why they gave birth to the important biogeochemical predictive models necessary for establishing a soil carbon project. It is also not crazy that fire emerged again as a critical tool — an ecological process in the hands of Indigenous Australians that shaped the nation for over 40,000 years. It is in these very landscapes where humanity emerged that new conservation strategies are now evolving.

Despite what many of the readers of *Science Chronicles* might hear in the U.S. about carbon markets being dead, the Europeans and Australians don't seem to be listening. And the evolution of the carbon market from the forest to the grasslands will not stop there. Beyond the immediate work in Australia (where a carbon economy is being based on the approved savanna burning methodology for areas with >1000mm of annual rainfall), new methodologies are being developed for lower rainfall areas and for sequestration based on improved fire management and for emissions reductions through feral animal control. And the Australian government is keen to export these new approaches to the African context, potentially to places like Zambia where fire plays a dominant role in shaping the landscape.

But why stop there? These same ideas can also be applied to the primordial seas; to some of the new ideas around blue carbon. But these two land-based authors, for the moment, will leave that to our coastal colleagues and another issue of *Science Chronicles*. We just wanted to alert others that the Conservancy is sharpening some new arrows for our quiver of conservation strategies, and dusting off tools that have worked for over 40,000 years to help us survive as we venture out from the forest and onto the plains. **SC**

**“It is not a crazy coincidence that the very mechanisms that predict the role of grazing and fire to changes in soil carbon evolved from decades of long-term research on the Serengeti plains.”**

## Bob Lalasz

# Why Everything You Know About Science Communications Is Wrong, and More Science Is the Answer

By [Bob Lalasz](#), director of science communications, The Nature Conservancy



Recovery begins by admitting you have a problem. But the *real* problem with communicating science — particularly around climate change and other issues involving risk — is that we're often focused on the *wrong* problem. And, as [a must-read new paper by Harvard risk communications scholar Dan Kahan argues](#), only getting truly serious about the science of science communications can keep us from digging the hole even deeper.

Think back to the last conversation you had about climate change with someone who wants global action on the issue. Chances are, the conversation quickly devolved into a cycle of finger pointing that went something like this:

- **Blame *scientists***, because they don't communicate the risks of climate change clearly and simply enough. Or emotionally enough. Or starkly enough. (Or maybe they shouldn't be communicating at all, because they're just no good at it.)
- **Blame *the media***, because they're not covering climate change enough (or prominently enough, or in a way that connects with people, or with the right mix of local and global relevance, or because the airwaves have been flooded with anti-climate-change rhetoric fueled by big money interests).

Image: Reynald Chabot. Image credit: Flickr user [Vu Bui](#) via a Creative Commons license.

- And **blame *the public***, because it's not scientifically literate enough to understand the risks of climate change, or it's too distracted by media-fueled triviality to care.

The assumption underlying all this blame? The public isn't getting the gravity of the problem — because if they did, how could they fail to act? (This is what Kahan and other social scientists call the “public irrationality thesis.”) Ergo: If we could just transfer our scientific knowledge to enough people (and make enough people receptive enough to understand it), those people would of course change their minds to agree with us, change their voting patterns and behavior in the ways we desire...and the world would be saved.

Communications scholars call this chain of reasoning the “injection” or “empty bucket” or “science deficit” model of communications. The real problem: [About two decades of science on the science deficit model have shown that it's not true.](#)

Instead, it's your cultural identity and norms — what Kahan calls “cultural cognition” — that are far more decisive for what you think about science (and even what you perceive as “scientific”) than how well or often findings were communicated, or how scientifically literate you are.

You're much more likely to believe science when it ratifies the assumptions of your friends and neighbors. You judge whether someone is a scientific expert on the same criteria. You even perceive *weather* to have been warmer or cooler based on your cultural worldview. Cultural cognition explains why positions on climate change have become so polarized and entrenched — because it's not about “the science”; it's about you. And yet most climate communicators — especially advocacy communicators — cling to the science deficit model when it comes to climate change, arguing that the answer to changing hearts and minds is simply bigger, louder, simpler, scarier projections and modeling outputs.

This habit — an insistence that the blunt force instrument of a one-size-fits-all message must work for everyone, because it so convincing to us — isn't just a bad one. It actually backfires. Indeed, Kahan and his colleagues have found that, the more science-literate an “individualistic/hierarchical” person is (as opposed to an “egalitarian/communitarian” person), the less likely they are to believe in the urgency of acting to stop climate change.

So what's the answer? Here's where it gets potentially frustrating, especially to those who think we needed that answer yesterday. Because what's bracing about Kahan's new paper is his *refusal* to give pat recommendations, and his insistence that science communications needs to grow up and take a “genuinely evidence-based approach” to what it does.

In other words: Be scientific.

**“You're much more likely to believe science when it ratifies the assumptions of your friends and neighbors.”**

In fact, the science of science communications has given us a rich catalog of lab-modeled techniques — but we can't just grab from this Chinese menu and start applying what looks good, says Kahan. (That would just be replicating our present reliance on blind instinct.) Instead, science communicators (and, let's face it, any scientist who wants to communicate effectively) need to treat their communications interventions scientifically — as hypotheses. To work with social scientists on experimental design. To collect data and measure their results. And to publish their results so others can learn from them. "Genuinely evidence-based science communication must be based on evidence all the way down," says Kahan, without pity.

That's strong beer to a lot of science communicators and scientists. It means we can no longer just be factory-style communicators — getting our findings out, getting a little media and social media attention for them, maybe generating some buzz on [academia.edu](http://academia.edu), and then moving on to the next paper with little or no metrics to measure our impact outside being asked to testify at a policy hearing.

Science is slow, and alongside the very real need to address climate change has arisen a culture of rhetorical urgency that will resist waiting years to assemble data. Do we have the patience for this kind of long game?

It's clear from his new paper that Kahan doesn't think we have much choice. And he sees hope and lots of opportunities at the local U.S. level, where he argues that the "influences that trigger cultural cognition when climate change is addressed at the national level are much weaker at the local one."

For instance, we could field test how we communicate about climate change in terms of local threats such as water scarcity, property damage, and drought, where Kahan says there's already "a natural shared vocabulary" that locals have "for thinking and talking about these issues, the use of which reinforces their sense of linked fate and reassures them they are working with others whose interests are aligned with theirs." (The Nature Conservancy has an abundance of projects — from agriculture to reducing risk from the effects of climate change to seasonal water scarcity in a growing number of river basins — that already fits this definition, so I'm optimistic that we could be early responders to Kahan's call.)

It's worth seeing whether local studies could give us tested, replicable findings that could break the rhetorical gridlock on climate change at the national level. After all, as Kahan points out, we already had a rich body of knowledge on the science of science communication before the climate crisis began — born out of public alarm in the 1970s over the safety of nuclear power. Had we applied this knowledge when James Hansen first began warning of the dangers of global warming in the late 1980s, he muses, "perhaps political conflict could have been avoided or at least reduced."

The situation is infinitely more polarized and complicated today. But how have our current communications approaches been working for us so far? The journey to science communications recovery might begin with a single study. **SC**

**"It means we can no longer just be factory-style communicators — getting our findings out, getting a little media and social media attention for them, maybe generating some buzz..."**

## 15 Seconds of Fame

### Gina Cosentino

Gina Cosentino is a political scientist who heads up the Conservancy's global strategy in indigenous and communal conservation. Her mission? To tip "the scales of eco-justice in favor of the good guys." Meet Gina.



**JUMP SHOT:** I like the dynamism and juxtaposition of being caught mid-air in a still photo. It's quite funny to look at pictures of me jumping near the Eiffel Tower, at Rockefeller Center, at a busy bazaar in India, amid ancient ruins in Europe, or in the Dolomites — in some of them it looks like I'm really flying!

**TREE HUGGER:** I grew up in Toronto, Canada's largest urban center. As a kid, I'd hop on the streetcar, go to the library, borrow some books, then get back on the trolley to a beach park on Lake Ontario. I'd sit under a huge maple tree and read books or draw pictures of the land and waterscape. It's one of my favorite childhood places. It exemplifies the value of nature — building community around nature, no matter where you live.

**MAKING A DIFFERENCE:** Conservation is the common pathway to achieving human and environmental security. How will what we do benefit those who rely on the environment for their survival and existence as a people? If we can partner with people in a way that respects their relationships with the natural world, incorporates their science and traditional knowledge, and incorporates goals of economic and social development — then I'll feel like I'm doing my job.

Indigenous people make up 5% of the world's population, they own and occupy 25% of the world's lands and waters, which represents 80% of the world's biodiversity. So we're dealing with a small but important subset of people. If we get our relationships

**Image: Jumping Gina at Sirimione, Italy (Lake Garda), the Dolomites and Tiffany's in New York City.**



with them right, we can have a huge social and environmental impact.

Social sciences play a key role. For example, political science can measure the impact of policy on social change, help us understand what makes social movements effective, measure human well-being, or how political culture, institutions, ideas and leaders matter to whether or not conservation solutions take hold. Political scientists use both humanistic and scientific perspectives, both of which are relevant to conservation.

**BORDER CROSSING:** In response to Canada's penchant for constitutional reform, Canadian political scientist Peter Russell said Canada is the only country that constantly pulls itself out by the roots to see if it's still growing. That says a lot about the Canadian mentality.

What I've learned since moving to DC: very few Americans know that Canada is the United States' largest trading partner, I feel at home living in the U.S., I under-appreciated Canadian healthcare, and apparently I have a noticeable 'Canadian' accent.

**ART:** I've had visual arts training since I was very young. My love of landscape painting speaks to my Canadian and European roots. Canada's Group of Seven were known for depicting iconic landscapes. My favorite painting from the Group of Seven is by Franklin Carmichael, "Autumn Hillside." I reproduced it when I was 15 — the painting is of the glorious forests in Ontario in autumn, my favorite season.

I still find ways to be creative. When I hit a block in my writing or research, I like to sketch. Even if I'm writing a business plan, I try to find the 'art' in whatever I do. For me, being creative is really about expressing ideas in innovative ways to catalyze some sort of change.

**BEARS:** I had an unnerving yet really special experience at the TNC board retreat in the Great Bear Rainforest last summer.

What I remember most vividly is what happened before we saw the bears. Streams of light were fighting their way through the trees, I was looking at the tiniest details — dew on leaves, rippling water in the river, moss on rocks. We were lucky to be there. Then we saw the bears: first a black bear, which meandered towards us and paused when it saw us. After a tense moment, it wandered away, thank goodness. We collectively breathed a sigh of relief. Moments later we realized that it had been spooked by a spirit bear downstream. It felt somewhat magical to see the Spirit Bear and to know TNC, with our First Nation partners, were helping to care for that special place.

**READING:** I just read *Troublemaker*, a history of social movements of the 1960s. This period was a crux of change on so many fronts — ideas, people, identities, cultures, politics, economic forces. The idea of being a troublemaker is a matter of perspective — I see it being a change agent and showing leadership.

I also spend a lot of time reading political theory and philosophy, both historical and contemporary. For fiction, I read the classics — the use of the English language is masterful. I'm about to finish *Jane Eyre*. I see reading as an adventure so I'm looking forward to what's next... **SC**

**Interview by Darci Palmquist. Know someone we should feature in this column? Please [email her](#) with comments or suggestions.**

## Blog Reel

Voices from the Conservancy's science blog, [Cool Green Science](#). Interested in contributing? Contact [Matt Miller](#).

“Table corals are not as long lived as some of their massive boulder forming community members. The reason is that table corals grow by dividing horizontally away from the center after reaching a certain thickness.” — Rod Salm in [The Life and Death of a Majestic Old Coral](#)



Image credit: Jerry Sintz/BLM

“These sorts of scandals might well also tip a new crowd over towards vegetarianism, or at least eating less meat and fish, and that will have huge environmental benefits. If you’re a farmer or a fisher reading this you should be angry of course. And we should all be demanding change.” — Mark Spalding in [Horse Meat and Dodgy Seafood](#)

“By human standards, bull bison are cantankerous, ill-tempered beasts. They run through fences, charge people or vehicles and cause headaches for ranch managers. As such, managers often intentionally or unintentionally select for docility when managing a herd.” — Matt Miller in [A Bull Fight for Conservation](#)

“Ultimately, nearly everything in the ocean somehow depends on phytoplankton. What happens to phytoplankton when ocean conditions change?” — Vera Agostini in [Oceans and Climate Change: Protecting the ‘Invisible’](#)

“As an ecologist, I can appreciate that even unlovable critters serve valuable functions in nature like decomposing organic matter and keeping the populations of other organisms in check. Then again, I never thought the indoors had room for biodiversity or strange ‘guests.’” — Jon Fisher in [How I Came to Love House Centipedes](#)

## Science Short

# Myopia and Nature Deficit Disorder

Morgan, I.G., K. Ohno-Matsui, and S.M. Saw. 2012. [Myopia](#). *The Lancet*, 379, 1739-1748.

In East Asia, 80% to 90% of high school graduates in urban areas have myopia. In Singapore, the prevalence of myopia has more than doubled since 1992. Why is this?

A new study published by the British medical journal *The Lancet* notes that myopia was once thought to be largely genetic, but this is no longer the case. It's as much environmental as genetic. A study of children in Sydney and Singapore found kids in Sydney had a 3% prevalence of myopia while the same age group and ethnicity in Singapore had a 29% prevalence rate — almost ten times higher.

The most significant factor associated with the differences: time spent outdoors. The kids in Sydney spent 13.75 hours a week outdoors on average compared to just 3.05 hours for the Singapore kids. Exposure to the sun's rays stimulates production of the retinal transmitter dopamine, which in turn stops the eye from elongating.

Thus, we can add myopia as another health issue that's linked to what Richard Louv called in his book *Last Child in the Woods* "nature-deficit disorder."

Fortunately, the cure is just outside the front door. **SC**

— **Craig Leisher**, senior social scientist, The Nature Conservancy

## Announcements

### Changes in Central Science

By Peter Kareiva

There are some new and ongoing science initiatives within the Conservancy that will shape work plans and career paths for years to come:

- **SNAP (Science for Nature and People, previously known as NatureLab):** a partnership between TNC, WCS and NCEAS to establish a research consortium as a global center of excellence focused on knowledge generation to sustain nature and human well-being (more on p. 5).
- **NatureNet Science Fellows Program:** a partnership with six of the world's leading universities to create a reservoir of new interdisciplinary science talent that will carry out the new work of conservation.
- **Science Impact Project (SIP):** a program to train a new cadre of scientific thought leaders at TNC (see [Science Chronicles, November 2011](#).)
- **Ecosystem service and climate science:** cutting-edge research to inform decision-makers, from economics of oyster restoration in the [Gulf](#), to new urban strategies, to [Dow](#).
- **Human Dimensions Program:** a new effort to bring in science capacity that can address the use of economics and social science in the design of conservation strategies and the measurement of conservation impacts on people.

All of these ventures reflect emerging themes in science and TNC:

- 1) The type of science we need and we pursue has broadened from inventory and biology to social science and economics and corporate practices.
- 2) Science, to have impact, needs to enter the fray and to entail communications far beyond the traditional TNC mode.
- 3) Fiscal realities make clear that rather than "staffing up," we should empower and mentor our existing science staff so that they can be global conservation leaders by working with external experts.

These changes also reflect the evolving priorities of Central Science. Our mission is to support implementation of the Global Challenges/Global Solutions framework through scientific leadership, particularly regarding social science, economics, measures and science communications.

To get SNAP and Fellows off the ground, I need to pull back from managing Central Science and delegate more. Although I will shift away from managing Central Science, I will continue as TNC's chief scientist and a member of the Executive Team.

To do that, we've made the following changes in responsibilities and foci of Central Science's key managers:

**Jen Molnar** has accepted the position of director of science, Central Science, and will directly report to me. In this role, she will be working to ensure that core science work is on target, well-coordinated, efficient and constantly evolving. She will be responsible for providing science leadership and support for

TNC's Global Priorities by partnering with global teams, field programs and External Affairs. Jen will also continue in her role as science lead for the TNC-Dow collaboration. Jen has the unique combination of science savvy and management experience to pull this off.

**Heather Tallis** joins the Conservancy as [lead scientist](#). Focusing on human dimensions in conservation, she is charged with developing an economics and social science program that will both bring new methods and tools to programs across the Conservancy and leverage and share lessons from field projects. She will be bringing together existing social science staff with a few new hires. In this new role, she will work with programs in the regions and external partners, including universities and the Natural Capital Project. She will report to me, but have a dotted line to Jen Molnar so that her work is aligned with TNC's Global Challenges and Global Solutions.

**Sanjayan** continues to function as lead scientist. He reports to and serves the Mark Tercek's office as well as Central Science. Sanj's focus is on media, public outreach and advising the Executive Team and Office of the President. Sanj is also a proven start-up guy (he started measures, he started the poverty and conservation venture, he started science and education, he started gender and conservation effort, and was the initial thinker behind SNAP). We expect Sanj to continue in this role.

**Craig Groves** is taking on a new strategic leadership role in SNAP, drawing on the fact he has worked for both WCS and TNC and thus is well positioned to help the two conservation NGOs work well together. He will also be serving as a senior science mentor for the Science

Impact Project. He is stepping down from his management role so that he can focus on mentoring and writing. Following on his seminal book, *Drafting a Conservation Blueprint*, he is writing a new book with Eddie Game that reflects the evolving planning approaches to conservation.

**Lynne Eder** is being promoted to director of operations and administration for Central Science. In this role, she will manage Central Science team relationships with all operational organizational departments. This includes managing the complex financial aspects of funding for the Central Science team, SNAP and NatureNet Science Fellows. She will ensure that the Central Science team is operationally efficient and effective by interacting with TNC's legal department, human resources and the finance team. Lynne also serves as the TNC financial contact to NatCap to streamline the relationship when contracts are involved.

**Bob Lalasz** will continue in his current position, director of science communications, but have the added responsibility of serving SNAP and the fellows program. This may mean he will have to increasingly rely on contractors to help and call upon senior science staff from around the Conservancy to help with mentoring and other writing assignments.

Finally, because of all the new moving parts and complexity of our work, **we will be hiring a new position** who will report to Lynne Eder, with a dotted line to Bob Lalasz and Jen Molnar. This person will identify strategic opportunities for synergy between new and existing science programs, foster exchange and coordinate resources, help with fundraising and be a steward of our existing awards.

Please email me at [pkarciva@tnc.org](mailto:pkarciva@tnc.org) with any questions about these changes. Our only goal in Central Science is to make sure the Conservancy's evolving work gets the best possible scientific support. **SC**

## March 21 at 2PM ET: North America Region Science Spotlight Webinar

The North America Region is hosting a webinar series to highlight some of the most exciting new TNC science happening in the U.S., Canada and Caribbean. In the wake of Hurricane Sandy, the March 21 webinar will focus on science in support of building Coastal Resilience. [Get the call-in info here.](#)

Know of science projects going on in our region that your colleagues should hear about? Please send your suggestions to [Brad McRac](#) and learn more about [upcoming webinars](#). **SC**

## December 9-13, 2013: TNC All-Science Meeting

The Hayes Mansion in sunny San Jose, CA, will host this powerhouse gathering of Conservancy scientists, staff and external experts from all over the world. Agenda details will follow in the coming months — expect diverse sessions on research, strategies, tools, techniques and much more. If you have questions, please contact [Lynne Eder](#), director of operations for Central Science. **SC**

# New Conservancy Publications

Conservancy-affiliated authors highlighted in bold.

Please send new citations and the PDF (when possible) to: [pkareiva@tnc.org](mailto:pkareiva@tnc.org) and [rlalasz@tnc.org](mailto:rlalasz@tnc.org). Please include "Chronicles Citation" in your subject line so we don't miss it.

Some references also contain a link to the paper's abstract and/or a downloadable PDF of the paper. When open source or permitted by journal publisher, these PDFs are being stored on the Conservation Gateway, which also is keeping a running list of Conservancy authored science publications since 2009.

Baldwin, R.F., S.E. Reed, **B.H. McRae**, D.M. Theobald, and R.W. Sutherland. 2012. Connectivity restoration in large landscapes: Modeling landscape condition and ecological flows. *Ecological Restoration* 30:274-279.

Binder, S., and **S. Polasky**. [Biodiversity, human well-being and markets](#). 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 435-439. Waltham, MA: Academic Press.

**Boucher, T., M. Spalding**, and **C. Revenga**. 2013. [Role and trends of protected areas in conservation](#). In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 485-503. Waltham, MA: Academic Press.

Burke, L., K. Reytar, **M. Spalding**, and A.L. Perry. 2012. Reefs at Risk Revisited in the Coral Triangle, Washington, D.C., World Resources Institute, with USAID-Asia, Coral Triangle Initiative, Coral Triangle Support Partnership, The Nature Conservancy, WorldFish Center, UNEP World Conservation Monitoring Centre 72.

Cavender-Bares, J., J. Heffernan, E. King, **S. Polasky**, P. Balvanera, and W.C. Clark. [Sustainability and biodiversity](#). 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 71-84. Waltham, MA: Academic Press.

Collie, J., V. Adamowicz, **M. W. Beck**, B. Craig, T. Essington, D. Fluharty, J. Rice, J. Sanchirico. 2013. Marine spatial planning in practice. *Estuarine, Coastal and Shelf Science*.

**Daily, G.C.**, Z. Ouyang, H. Zheng, S. Li, Y. Wang, M. Feldman, **P. Kareiva**, **S. Polasky**, and **M. Ruckelshaus**. 2013. Securing natural capital and human well-being: Innovation and impact in China. *Acta Ecologica Sinica* 33:669-676.

Dobson, A.P., K. Nowak, and **J.P. Rodríguez**. Conservation biology, discipline of. 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 238-248. Waltham, MA: Academic Press.

**Game, E.** [Identifying conservation priorities using a return on investment analysis](#). In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 185-198. Waltham, MA: Academic Press.

**Goldman-Benner, R.L.**, **S. Benitez**, **A. Calvache**, **A. Ramos**, and **F. Veiga**. 2013. [Water funds: A new ecosystem service and biodiversity conservation strategy](#). In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 352-366. Waltham, MA: Academic Press.

Guerry, A.D., **M.H. Ruckelshaus**, M.L. Plummer, and D. Holland. Modeling marine ecosystem services. 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 329-346. Waltham, MA: Academic Press.

**Kareiva, P.**, M. Marvier. [Ecology, concept and theories in](#). 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 1-8. Waltham, MA: Academic Press.

- Kiesecker, J., K. Sochi, M. Heiner, B. McKenney, J. Evans, and H. Copeland.** 2013. [Development by Design: Using a revisionist history to guide a sustainable future.](#) In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 495-507. Waltham, MA: Academic Press.
- Leisher, C., M. Sanjayan.** [Conservation and the world's poorest of the poor.](#) 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 230-237. Waltham, MA: Academic Press.
- Leisher C, L.H. Samberg, P. van Buekering, and M. Sanjayan.** 2013. [Focal areas for Measuring the human well-being impacts of a conservation initiative.](#) *Sustainability* 5(3):997-1010.
- Nuñez, TA, J.J. Lawler, **B.H. McRae**, D.J. Pierce, M.B. Krosby, **D.M. Kavanagh, P.H.** Singleton, and J.J. Tewksbury. 2013. Connectivity planning to address climate change. *Conservation Biology*. doi: 10.1111/cobi.12014.
- McDonald, R.I.** [Implications of urbanization for conservation and biodiversity protection.](#) 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 231-244. Waltham, MA: Academic Press.
- Mcleod, E., K.R.N. Anthony, A. Andersson, R. Beeden, Y. Golbuu, J. Kleypas, K. Kroeker, D. Manzello, R.V. Salm, H.i Schuttenberg, and J.E. Smith.** 2013. Preparing to manage coral reefs for ocean acidification: lessons from coral bleaching. *Frontiers in Ecology and the Environment* 11: 20–27. <http://dx.doi.org/10.1890/110240>
- McRae B.H., S.A., P. Beier, and D.M. Theobald.** 2012. Where to restore ecological connectivity? Detecting barriers and quantifying restoration benefits. *PLoS ONE* 7(12): e52604. doi:10.1371/journal.pone.0052604.
- Opperman, J.J., G.E. Galloway and S. Duvail.** [The multiple benefits of river–floodplain connectivity for people and biodiversity.](#) 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 144-160. Waltham, MA: Academic Press.
- Robertson B.A., and **P.J. Doran.** 2013. [Biofuels and biodiversity: the implications of energy sprawl.](#) In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, Volume 1, pp. 528-539. Waltham, MA: Academic Press.
- Rubenstein, D.I., **M. Hack.** [Migration.](#) 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 309-320. Waltham, MA: Academic Press.
- Spalding, M., V. Agostini, S. Grant, and J. Rice.** 2012. Pelagic provinces of the world: a biogeographic classification of the world's surface pelagic waters. *Ocean and Coastal Management*, v. 90, p. 19-30.
- Sutherland, W.J., S. Bardsley, M. Clout, M.H. Depledge, L.V. Dicks, L. Fellman, E. Fleishman, D.W. Gibbons, B. Keim, F. Lickorish, C. Margerison, K.A. Monk, K. Norris, L.S. Peck, S.V. Prior, J.P.W. Scharlemann, **M.D. Spalding**, and A.R. Watkinson. 2012. A horizon scan of global conservation issues for 2013. *Trends in Ecology and Evolution*.
- Tallis, H., A. Guerry, and G.C. Daily.** 2013. [Ecosystem services.](#) In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 96-104. Waltham, MA: Academic Press.

Van Lavieren, H., **M. Spalding**, D. Alongi, M. Kainuma, M. Clüsener-Godt, and Z. Adeel. 2012. Securing the future of mangroves: A policy brief. Hamilton, Canada, UNU-INWEH, UNESCO MAB with ISME, ITTO, FAO, UNEP WCMC and TNC.

West, P.C., R. Biggs, **B.A. McKenney** and C. Monfreda. [Feeding the world and protecting biodiversity](#). 2013. In: Levin S.A. (ed.) *Encyclopedia of Biodiversity*, second edition, pp. 426-434. Waltham, MA: Academic Press.

Zu Ermgassen, P.S.E., **M.D. Spalding**, R. Grizzle, and **R. Brumbaugh**. 2013. Quantifying the loss of a marine ecosystem service: filtration by the Eastern Oyster in US estuaries. *Estuaries and Coasts*, v. 36, p. 36-43.

Zu Ermgassen, P. S. E., M.W. Gray, C.J. Langdon, **M.D. Spalding**, and **R. Brumbaugh**. 2013. Quantifying the historic contribution of Olympia oysters to filtration in Pacific Coast (USA) estuaries, and the implications for restoration objectives. *Aquatic Ecology*.