SCIENCECHRONICLES

Hart Prairie Preserve, Arizona. Credit: Mark Skalny

Editor's Note

Few people remember Annie Lee Moss.

She was a mild-mannered communications clerk in the Pentagon in the late 1940s. She ran afoul of Sen. Joseph McCarthy, who summoned her to testify before his committee. She had done nothing whatever to merit such scrutiny, as was true of so many others, but this time things did not go well for McCarthy or his chief henchman, Roy Cohn. There were two reasons; one, Cohn got crosswise with some fundamental legal principles, like the right to confront ones' accusers. But more important, a cameraman for the CBS program *See It Now* happened to film the whole thing.

It is nearly impossible now to imagine what it was like not to have instant access to an overwhelming amount of information. Yes, newspapers covered the hearings and yes, many more people read newspapers back then, but it was one thing to read about it and quite another to have it brought into the living room by perhaps the most respected journalist of the day, Edward R. Murrow, who oversaw *See It Now*.

All of this comes to mind because I happened to see *Good Night, and Good Luck*, George Clooney's worshipful 2005 film about Murrow. But it also brought to mind another, more recent film, *Spotlight*, about the Boston Globe reporters who uncovered the sexual abuse scandal in the Catholic Church. It's brilliant, and deserving its Best Picture Oscar.

Both films, as well as a new book by Univision's Jorge Ramos, raise the question of neutrality vs. advocacy in journalism, a question that the current, norm-shattering presidential campaign makes even more relevant. At what point does the value of confronting self-evident mendacity or hypocrisy outweigh the value of balanced and unbiased reporting? The stakes were high for Murrow at a time when few were willing to confront a powerful and ruthless politician. They may be higher now. And I'm not just talking politics.

The question about the proper role of conservation scientists as advocates is as old as the field itself. But it hardly gets Hollywood's attention (unless you count Al Gore's slideshow, and I'm not sure you should). So the debate continues to little effect in the journals and at conferences — the most recent issue of Conservation Biology carried just such an article, but discussions of the emergent and multidimensional quality of scientific credibility, however cogent and well-intentioned, will not resonate in the public mind.

So where is out Murrow, our Spotlight crew? I don't know, but we need them.

Good night, and good luck.

SC

Jonathan Adams (pangolin19@gmail.com) is a science writer and editor based in Maryland. Visit PangolinWords.com or follow him on Twitter.

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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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Article

Digital Restoration

By Neil Chapman, Northern Arizona Program Restoration Manager, and Travis Woolley, Forest Ecologist, The Nature Conservancy

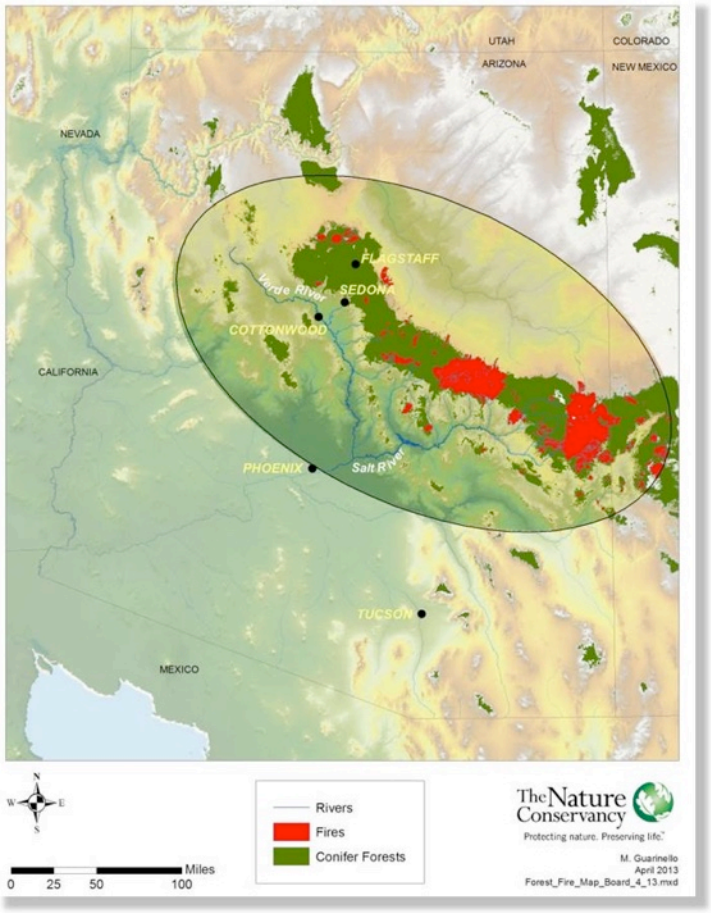
Santa Fe National Forest. Credit: Neil Chapman/TNC.

Extending 250 miles from the Grand Canyon east into New Mexico, northern Arizona is home to more than 2.5 million acres of Ponderosa pine forest (*Pinus ponderosa* var. *scopulorum*). It is the largest continuous forest of ponderosa in the world. The forest emerges around 6,000 feet atop the southern edge of the Colorado Plateau above the surrounding lower elevation pinion-juniper forests, grasslands and deserts (figure 1). Winter snow provides year-round flow to two of Arizona's most important rivers – the Salt and Verde – which provide irrigation and municipal water supplies for small communities and large cities, including Phoenix. Communities such as Flagstaff, Williams, Pinetop, Eager, Springerville, and many others are completely surrounded by the forest and rely on tourism, recreation, home development, and forest products to drive their economies.

Prolonged drought and a warming climate have left the forest stressed for water and highly vulnerable to large high severity fires.[1] Between 2002 and 2011 more than one million acres has burned affecting infrastructure, local economies, tribal lands, and vast tracts of public lands.

The 2002 Rodeo-Chediski fire burned 438,000 acres on Apache Tribal Lands and the Tonto and Apache-Sitgreaves National Forests. Over 400 structures were lost and total costs are estimated to have exceeded $300M.[2] The 2010 Shultz Fire burned 15,000 acres on the Coconino NF with $59M spent on fire suppression. Total economic impact is estimated at $133-147M (NAU Report.[3]) The 2011 Wallow Fire burned 538,000 acres on Apache Tribal Lands and the Apache-Sitgreaves NF. Suppression costs alone exceeded $109M.[4]

Figure 1



The fires galvanized public attention and helped forge an agreement among the U.S. Forest Service, business community, and stakeholders to develop an ambitious restoration plan known as the Four Forest Restoration Initiative (4FRI), now one of TNC's Restoring America's Forests demonstration sites. 4FRI covers 2.4 million acres of ponderosa pine within the Kaibab, Coconino, Tonto, and Apache-Sitgreaves National Forests.

The scale of our forest health problem has grown beyond the potential of traditional approaches. 4FRI is proposing to accelerate restoration across the 2.4 million acres over the next 15 - 20 years, an increase of three to four times the current pace. Although 4FRI has a large, easily-accessible supply of timber, the entire tree (stem and biomass) needs to be removed by private sector wood harvesters creating several economic, policy, and institutional issues that need to be addressed.

The scale of our forest health problem has grown beyond the potential of traditional approaches.

- With public funding declining, current agency practices are not sustainable. The agency costs of planning and administering forest management need to be reduced. The current value of ponderosa pine products is extremely low. Therefore private sector fees and payments to the USFS in return for access to the timber will not offset the agency costs of project layout and/or monitoring.

- Developing a successful business model will require innovation and greater operational efficiencies. Private sector investment is essential to process the pine logs, biomass and residual wood products.

- Finally, to treat our forests in a timeframe that matters and overcome years of controversy and litigation, transparency will need to be increased and trust enhanced. To facilitate greater transparency and provide a basis for learning and adaptive management, a reliable and feasible monitoring program is needed.

TNC strategy

The core strategy of The Nature Conservancy in Arizona helps resolve two challenges: the low value of small-diameter wood and associated biomass; and the tentative social acceptance of large-scale treatments.

AZ TNC's Forest Team is leading a project to integrate off-the-shelf hardware, software, and spatial data to accelerate project implementation by both USFS and private sector wood harvesters. This technology aims to provide a low-cost approach to collecting data across large scale restoration efforts that can be used to facilitate adaptive management. We are currently calling this suite of technologies and practices the Digital Restoration Guide, or DRG.

The use of technology in the form of GPS-enabled tablets can help increase the amount of acreage prepared by the U.S. Forest Service for treatments; reduce harvesting costs borne by private industry; and obtain real-time monitoring data to inform adaptive management. Working with U.S. Forest Service, Arizona State Forestry, and stakeholders, TNC is the principle investigator with this innovative project.

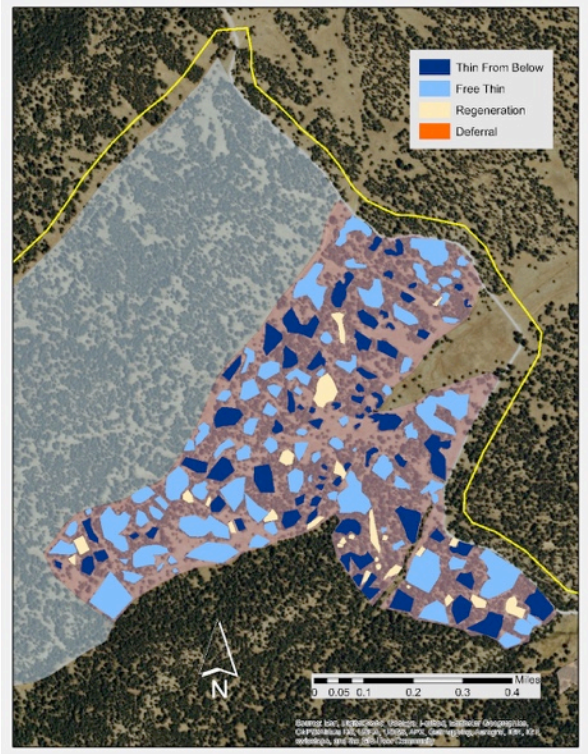


Figure 2: Digitally marked tree clumps and groups

Digital tree marking and harvesting

To reduce costs and increase the pace and scale of restoration, the USFS is implementing a **Designation by Prescription** process ("DxP") in which written prescriptions are provided to operators, rather than leave trees being marked with paint. Harvesters have the discretion to determine which trees to cut. At least 75% of restoration units in the Four Forest Restoration Initiative will not be traditionally marked with paint. This creates uncertainty as to whether desired conditions will be achieved, as well as uncertainty in operator success and efficiency. The change from marking trees to a "DxP" model could, at least in the near term, greatly slow the pace of forest restoration.

Some stakeholders are skeptical that desired conditions will be met regardless of tree selection method, which threatens the social license obtained through the collaborative process. Minimizing the uncertainty in the DxP process will help foster and maintain trust. As more complex prescriptions (e.g., groupy/clumpy tree spacing) are given to contractors, there is a need to assess their ability to obtain the desired condition. Timely information is needed to make adaptive changes to either prescriptions or implementations do not meet stakeholder developed outcomes. The hand held tablets give USFS staff the ability to compare prescriptions/marking to what occurred on the ground, in a rapid fashion.

Using ESRI ArcGIS online, Collector App and a TNC developed geodatabase for use on handheld tablets (Android or IOS), restoration units can now be digitally marked. Marking crews use tablets to designate spatially where tree clumps and groups should be placed (Figure 2), and generally how the structure in those areas should look.

Figure 2 illustrates how marking crews create polygons as they designate and determine the appropriate group/size and category based on what structure and density currently exists. Four types of treatments are prescribed:

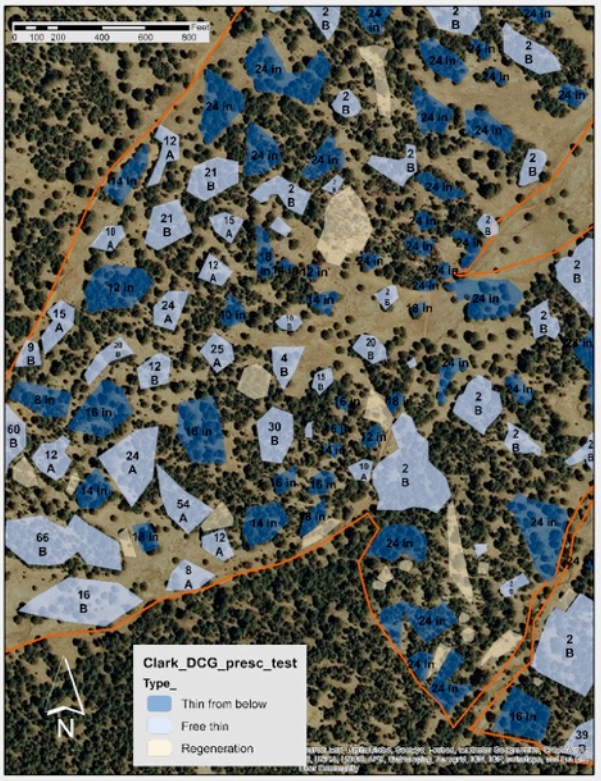


Figure 3: DRG input to in-cab tablets for use by operators

- Deferral (no entry; e.g., archeological sites, etc.)
- Thin from below - remove trees based on an upper diameter limit
- Free thin - a designated number of trees or a specific spacing structure would be left based on existing and desired size distributions
- Advanced regeneration - allow for an uneven age/size class distribution by removing mid-age trees in areas where young healthy trees exist

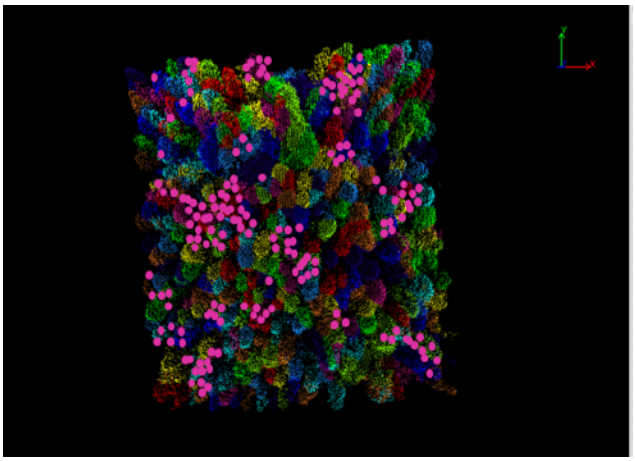
Using ESRI ArcGIS online, Collector App and a TNC developed geodatabase for use on handheld tablets (Android or IOS), restoration units can now be digitally marked.

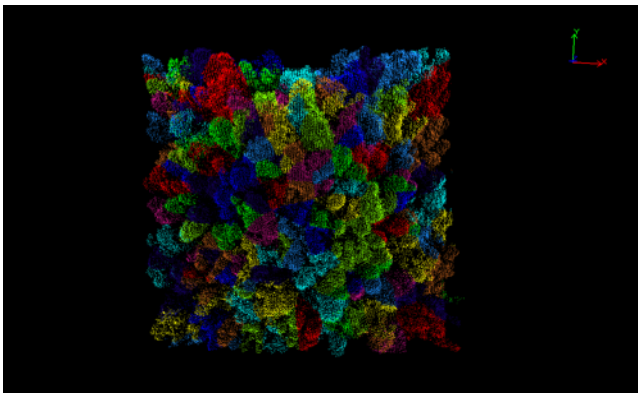
In the restoration unit depicted in Figure 3, interspace between groups has simple rules defining what to leave. Harvesters will most often be instructed to remove all ponderosa pines except for yellow pines showing old growth characteristics and trees >24" creating openings for important native species like Arizona fescue (*Festuca arizonica*) and Gambel oak (*Quercus gambelii*).

To provide an even greater level of information for operators, the digitally marked polygons from handheld tablets can be further labeled before being uploaded to GPS-enabled in-cab tablets being tested by TNC and wood harvesting contractors. The digitally-marked map is used by the harvester to navigate within a stand and to assist with decisions regarding placement and structure of clumps/groups and interspace. The tablets also provide harvesters with a digital map of the work unit and other data such as aerial imagery, roads, stand/unit boundaries, as well as the digital tree harvest polygons. The tablets record the number of trees harvested per unit of time enabling operators to monitor productivity. They also provide UTM coordinates for every tree harvested. TNC is working with partners, including the USFS Technology and Development Center to assess new technologies that will allow for real time harvested tree diameters to be recorded as well as location.

Integration of Digital Tree Marking, Digital Tree Harvesting, and Monitoring Plan

TNC, 4FRI stakeholders, and USFS have created a Multi-Party Monitoring Board tasked with developing an adaptive management framework to help resolve concerns within the implementation plan. This framework is focused, in part, on structural and spatial patterns. These attributes occur at multiple scales, from groups of trees and openings up to landscape scale patterns. However, acquiring ground-based data at landscape scales will be time and cost prohibitive. The ability to assess implementation in near real-time would increase transparency, facilitate adaptive management, and enhance trust.





Figs 4A (above) and 4B

Evaluating implementation involves data on what is left following treatments. To address this need, TNC is testing the integration of harvest tree location data with remotely-sensed forest structural data, particularly Light Detection and Ranging, also known as LiDAR (Figure 4A). Updating pre-harvest LiDAR data with post-harvest forest structural changes (Figure 4B) could provide a low-cost, rapid method for monitoring implementation across large-scale landscapes. The three-dimensional nature of these data can provide a powerful platform for modeling important metrics of forest health, such as fire risk and wildlife habitat attributes. Post-treatment parameters like basal area, canopy cover, and sizes or variability of openings created can also be determined without the need to obtain additional post-harvest remotely-sensed imagery.

Current DRG Pilot Project on the Ground

TNC and USFS staff developed digitally marked restoration prescriptions on the Coconino National Forest Clark Task Order in 2015, part of a 300,000 acre contract issued within the Four Forest Restoration Initiative. The Clark Task Order will provide a comparison of three different methods of planning and implementation for forest restoration in ponderosa pine. Traditional leave-tree paint marking was completed on 680 acres; Designation by Prescription is planned for 1,000 acres; and within one unit of DxP 400 acres of prescriptions using the digital tree marking concept will be treated. All three sites will be harvested by the same contractor using GPS enabled in-cab tablets. Tree harvest operations are expected to begin in the summer of 2016 allowing for a proper assessment of the Digital Restoration Guide concept from start to finish.

TNC is also working with Arizona State Forestry (AZSF) on a second restoration unit on State Land that will implement a similar approach. Field operations will begin in mid-April 2016. This will provide feedback from additional operators and continue to refine the DRG based on both state and federal agency guidelines.

Recently the Flagstaff Ranger District on the Coconino National Forest allocated an additional 5,000 acres for digital tree marking (Table 1). TNC, 4FRI and Coconino National Forest staff are developing the data bases and protocols and the USFS Enterprise Teams will begin marking the Fort Valley timber sale in late April 2016.

Table 1: Approximate split on designation for FY 16--Flagstaff RD

Sale	Paint acres	DRG acres	No Designation	TOTAL
Fort Valley	400	1,100	500	2,000
Johnney's	600	1,400	1,000	3,000
Pinegrove	1,200	1,000	800	5,000
Marshall	300	1,500	500	2,300
TOTAL	**2,500**	**5,000**	**2,800**	**10,300**

Outcomes to Date

Table 2 below provides a comparison of productivity, administrative steps, and costs associated with three methods of planning and implementation tested during our pilot.

In our comparison of marking with paint and using the DRG on the Clark Task Order (Table 2), efficiency improved from marking 8 acres/day to 40-60 acres/day using the DRG. Layout costs decreased from $40 per acre to $16.

Through this process we were able to gain necessary feedback from our test marking crew that enabled us to identify ways to simplify both the marking and symbology used to guide operators.

Future Potential Uses and Testing

In addition to marking crews, agency silviculturist using hand held tablets with TNC developed databases have potential to streamline inventory practices to better collect and communicate the specific site data between agency specialists.

The digitally marked tree harvest maps can then be used by timber sale administrators (TSA's) to assess contract compliance. Digital maps with TSAs notes would save time and paper over traditional maps while allowing for rapid and specific feedback to wood harvesters. **SC**

Table 2 – Comparison of productivity, administrative steps, and costs associated with three methods for planning and implementing restoration treatment prescriptions.

USFS Process	Current Marking	Current DxP	Digital Restoration Guide
Personnel Production	8 ac/day/person	17 acres/day/person	40-60 acres/day/person
Paint	Trees/boundary	Boundary Only	Boundary only
Extra Admin. steps	None	Yes	None
Desired Condition	Exact as marked	Unknown^	As marked by DRG^
Layout Cost	$40/acre	$13/acre	$16/acre
Administrative	+	+	+
Implementation Production	*	*	*

* Currently awaiting harvesting operations for testing
+ Currently being assessed by USFS

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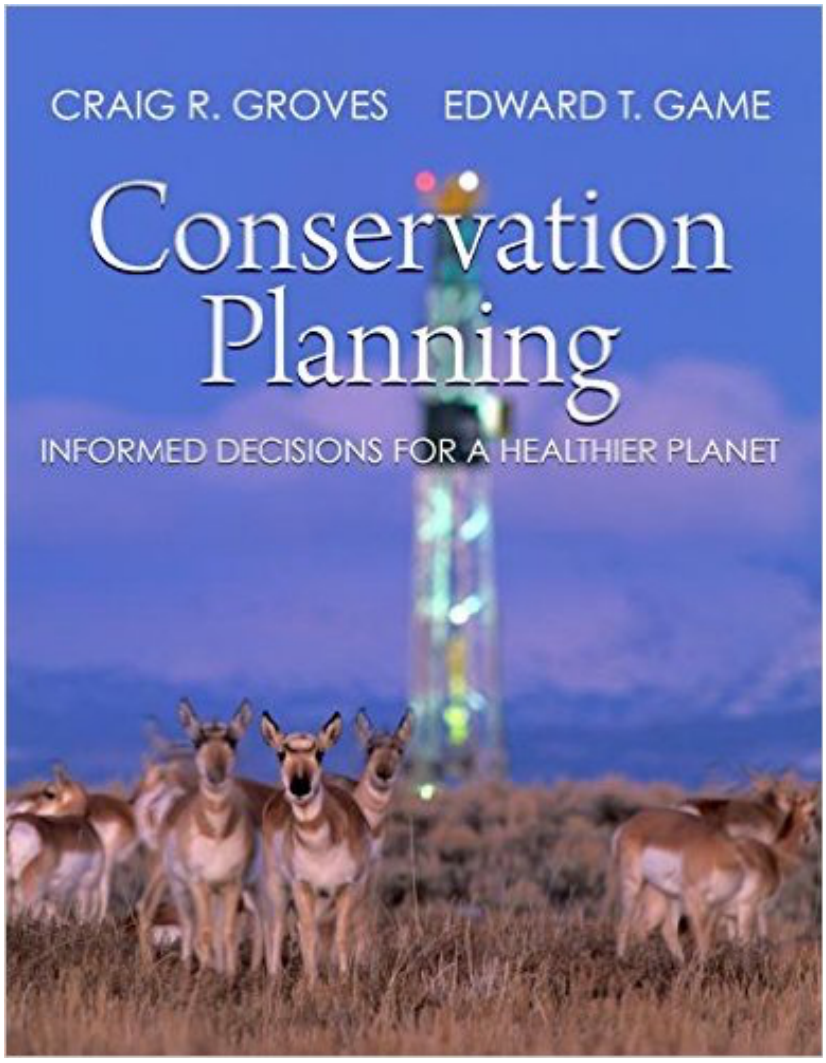
Book Excerpt

Conservation Planning: Informed Decisions for a Healthier Planet

2015. W.H. Freeman. 608 pages.

By Craig R. Groves, Executive Director, Science for Nature and People Partnership, and Edward R. Game, Lead Scientist, Asia Pacific Region, The Nature Conservancy



Imagine a watershed where the mountainous forests in the headwaters are rich in endemic species, and are also the primary source of drinking water for a major city. Native shrublands and grasslands in the foothills are slowly being fragmented by agricultural expansion that endangers several wildlife species. Poor logging practices are degrading water quality and the ecological integrity of the forested landscape. Downstream in the watershed, new dams are being pro- posed as climate change–induced periods of drought pose long-term threats to water supplies.

A regional conservation plan has high- lighted how critical this landscape is to conserving biodiversity and some ecosystem services. Scientists and planners are just beginning to wrestle with the myriad problems they need to confront to conserve this landscape and watershed. Although they have given considerable attention to the species and ecosystems of interest, they recognize that more of the planning effort will need to be directed at under- standing the social, political, and economic context that exists in the watershed.

The watershed we have just described could be almost anywhere in the world, and although fictitious, the challenges presented by this hypothetical project probably sound all too familiar. At the same time, these are exactly the types of challenges that the methods and tools of conservation planning were designed to address.

Twenty years ago, systematic planning efforts to conserve nature were rare in most conservation organizations and government agencies. Nature conservation was too often an ad hoc and inefficient enterprise that was largely focused on opportunities.

Now that has all changed. Private donors, foundations, multilateral organizations, and governments have provided millions of dollars in funding to systematically develop conservation plans. These plans contain visions, goals, priority areas, conservation outcomes, and strategies and actions to achieve those outcomes. Conservation planning, in all its different forms and fashions, is now both an expected and a valued practice in nongovernmental organizations and government agencies alike.

Why Plan?

Nature conservation is an increasingly complicated business. Many, if not most, conservation projects and natural resource management programs involve solving complex problems that have ecological, social, political, and economic dimensions.[1] In part, these problems are complex because humans are increasingly the dominant force affecting the world's species and ecosystems—presenting a challenge that has been referred to as "conservation in the Anthropocene."[2]

Conservation has become such a challenging enterprise that developing adequate strategic responses that have a good chance of succeeding often requires a considerable amount of forethought and planning.

Whereas biodiversity conservation was once heavily focused on conserving species across landscapes, the Millennium Ecosystem Assessment, conducted under the auspices of the United Nations Environment Programme, awakened the conservation community to the importance of conserving ecosystem processes and services, such as water provision and nutrient cycling, and the benefits these processes can provide to people. In short, conservation has become such a challenging enterprise that developing adequate strategic responses that have a good chance of succeeding often requires a considerable amount of forethought and planning.

There are, of course, many reasons to plan. Conservation biologist Kent Redford and colleagues[3] have suggested that conservation plans are intended to answer two major questions: where on the ground (or in the water) are the most important places to undertake conservation activity to achieve the stated goals of a project, and what are the strategies, interventions, and actions that are best to implement. Conservation biologists and planners often refer to planning processes that answer the former question as spatial and those that answer the latter question as strategic.

The "where" question has been the subject of hundreds of articles in scientific journals that broadly address the topic of conservation planning or spatial planning, but strategic planning for conservation has received far less attention. In the end, all plans, spatial or strategic, are about allocating resources to some sort of conservation action, so we see spatial planning simply as part of strategic planning.

Although there are many good reasons to engage in conservation planning, we believe that the most important reason is to develop effective strategies and actions that will lead us to better conservation outcomes than intuition alone would lead us to. This is the fundamental assumption of any type of planning—that a thoughtful, deliberate planning process will lead to better decisions and better conservation outcomes than those conducted with a less thoughtful process.

Any approach to nature conservation — and in turn, conservation planning — faces many challenges; but a particularly difficult one may be the framing of conservation as integrating the needs of nature and people. For one, we have only a limited understanding of the ways that nature contributes to people and human well-being in particular. Moreover, adding people to the conservation planning equation[4] in any significant manner certainly increases the complexity of the planning process, and most conservation organizations and natural resource agencies are still stronger on the ecological aspects of conservation than on the social and economic. In addition, measuring outcomes in terms of monitoring and evaluation for people and nature can get difficult in a hurry. There are almost inevitably trade-offs in conservation efforts for people and nature. Indeed, one of the most significant challenges in conservation planning moving forward will be better understanding and estimating these trade-offs, and then making strategic decisions based on that understanding.

Our hope and desire for this book is that the approach to conservation planning we have taken will inform these critical decisions and will indeed lead to conservation efforts that result in a healthier planet.

Conservation planning in the decade ahead inevitably faces a variety of challenges. Fortunately, few conservation planning teams will face all of them. But many will face at least one or more of them, and for that reason we endeavor in this book to highlight the methods and tools that will allow planners and practitioners to success- fully confront many of these challenges. For example, we highlight methods for better bringing social and economic data into the planning process and the types of social and economic data that are needed and generally available for conservation planning. We emphasize participatory approaches that are essential to getting all the right stakeholders to the planning table. This helps ensure that from the outset, objectives are established for conservation projects that have buy-in from those who have a stake in the outcome. We focus on the importance of evidence throughout the planning process —from setting conservation targets to evaluating a range of alternative interventions to feedback from monitoring and evaluation on which actions are most effective. Through numerous case studies and examples, we demonstrate the importance of tessellating the entire landscape and seascape for conservation plans so that all land and sea uses are being taken into consideration in the planning process regardless of the specific objectives.

Nevertheless, we will certainly stop far short of suggesting that we have all the answers for the challenges we just articulated or that those are the only challenges conservation planners will face. Still, we hope that this book provides planners, scientists, and conservation practitioners with the tools they need to make informed decisions. Our view has been that conservation planning is fundamentally about making important decisions: what do we want to conserve, who wants to conserve what, where should we do it, how should we do it, what resources will it take, and how will we know we have done it? Our hope and desire for this book is that the approach to conservation planning we have taken will inform these critical decisions and will indeed lead to conservation efforts that result in a healthier planet. **SC**

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Conservation Planning: Informed Decisions for a Healthier Planet is available from Amazon.

Announcement
TNC Launches New Center for Sustainability Science

By Jen Molnar, Managing Director and Lead Scientist, Center for Sustainability Science, The Nature Conservancy

Columbia Bottomlands, Texas. Credit: Jennifer Molnar/TNC

TNC is launching a new Center for Sustainability Science. It will provide science leadership and capacity to create transformational impact with the business sector and governments, by translating the value of nature and our conservation approaches into actionable, science-based solutions. I will lead the work of the Center as its managing director and lead scientist.

Our organization has long recognized that working across sectors is needed to achieve the ambition of our global vision, and TNC's science-based approach can provide a critical entry point for our collaboration with businesses and agencies.

We need companies and government agencies to recognize nature's value and be partners in implementing our ambitious strategies, but often they do not have the tools and data to build nature into their own business and policy decisions. The new Center for Sustainability Science aims to help fill this critical gap, working hand-in-hand with our global strategy teams and our regional programs to identify ways in which science can

support the implementation of solutions that can achieve systematic changes and large-scale conservation results.

To succeed in our mission, we need to be able to make a clear and compelling case to business and government as to why they should invest in nature and conservation strategies. This includes reframing our science evidence in terms that are relevant to these decision-makers. We then need to be able to give them clear guidance on how to act in the most efficient and impactful way.

One example of where science has played a key role in scaling conservation solutions in the private sector is through the TNC-Dow collaboration. Pilot analyses showed how nature is relevant to their decision-making – for water supply, coastal protection, reforestation for air quality, in agricultural supply chains. The collaboration team then worked on how to scale this approach across the corporation's decision-making. This led to The Dow Chemical Company's announcement last year of their groundbreaking 2025 Nature Goal, in which they committed to consider nature in evaluation of all of the company's capital, research and development, and real estate projects – thousands of projects a year – while aiming to generate $1B in business value through nature-enhancing projects. The TNC-Dow collaboration team is now working to help Dow implement this goal, including through the deployment of a new rapid assessment tool, the ESII Tool (Ecosystem Service Identification and Inventory) that TNC co-developed with Dow and ESG.

To succeed in our mission, we need to be able to make a clear and compelling case to business and government as to why they should invest in nature and conservation strategies.

While it has been inspiring to see a Fortune 50 company fundamentally changing how they make decisions, it has also been instructive to see just what this type of business change will require in practice – and what that means for science analysis. There is an important need for co-creating solutions and tools that companies can use and trust, such as the ESII Tool.

The Center for Sustainability Science seeks to build and expand on experience with this type of systemic change, and target development of science-based solutions with the public and private sectors to accelerate and increase the scale of the conservation impact.

The Center will allow us to be more strategic and nimble in bringing resources and expertise to opportunities in the private and public sectors. It will have a small core team of dedicated scientists and economists, as well as fellows who will bring needed expertise and capacity for projects and initiatives over shorter periods of time. It will also draw in and collaborate with staff from across TNC and external partners.

By co-creating natural solutions with decision-makers we see important opportunities to improve outcomes for both the economy and the environment. The scale of action needed is great, but through science and technology we can foster partnerships across sectors for an even greater impact. **SC**

Article

Women in Science Summit

By Heather Tallis, Senior Conservation Scientist, The Nature Conservancy.

Credit: Justine E. Hausheer/TNC

I've been in a lot of conversations about gender bias in science. Going into a recent conference on that very topic, I feared the conversations would feel stale, that we would rehash all the same issues. Nothing would change.

Instead, I left feeling energized, like we had really made a difference.

The event was the Women in Science Summit, which I co-hosted along with Meg Lowman from the California Academy of Sciences, and Rita Mehta from University of California, Santa Cruz. It was a one-day event in January to bring attention to persistent issues of gender bias in the sciences, and provide early career scientists an opportunity to hear from those who have confronted gender issues throughout their careers.

We had an incredible roster of speakers and panelists, including our Global Board Member Jane Lubchenco, and other greats in the field like Sylvia Earle, Pam Matson, Jane Goodall, Joan Roughgarden, Kathy Sullivan, Dawn Wright and Tom Lovejoy, along with early career leaders like Kate Clancy, Jonathan Eisen and Emily Graslie (if you don't know these folks, look them up!).

Such a roster, representing such a variety of experience, drove home just how much great progress has been made, and how much we all still have to learn on this critical issue.

Certainly, there are some great, progressive policies emerging that help women stay engaged in science at critical times in their careers. The University of Wisconsin provides nannies to grad students with young children so they can attend professional conferences. I've never heard of that anywhere else, and it gives me both hope and motivation to ask for the same here.

Perhaps the most unexpected takeaway for me was the realization that the use of science to help address gender bias can be a slippery slope. We heard about a lot of good science clarifying when, how and what kind of discrimination is happening in field science, particularly from Kate Clancy. We heard about selection bias by men and women in the hiring process. This kind of research is very powerful and important—it helps us see the problem clearly, and identify effective solutions.

There's a different role science is commonly asked to play that I find damaging and misplaced. We are often asked to use science to justify the inclusion of women, or to demonstrate what in particular women add to the scientific process. This line of questioning is common, because we want to make all the cases we can for inclusion, and as scientists, we default to evidence-based arguments. In the case of equality, this feeds the impression that we still need to prove the value of women in science. This is simply not true. I find this line of questioning degrading, not liberating or empowering.

Perhaps the most unexpected takeaway for me was the realization that the use of science to help address gender bias can be a slippery

This realization started to crystalize for me at the Summit; a few weeks later, I was asked to collaborate on a study to show once and for all what women add to science and conservation. My gut reaction was visceral—no, I will not do more research that feeds that line of thinking! But I tentatively agreed, in an effort to put the issue to rest. The more I thought about it, the worse it felt.

On the plane ride home from that interaction, I watched the movie "Straight Outta Compton," about the rise of NWA and other hip hop groups out of Los Angeles in the late 1980s. It's a raw movie that brings into clear light the incredible bravery those musicians showed in confronting institutionalized racism. I felt hollow after watching it, and inspired to confront discrimination more directly. I couldn't focus on my work, so I wrote a blog about why asking for science justifying inclusion of women is so debilitating. And I won't be doing that study.

And that blog struck a chord: it has generated tremendous traffic on Cool Green Science and prompted a lot of discussion on social media. Unfortunately, all too many women are still asked to justify their presence on academic panels and in other fora.

Finally, I was reminded that things ARE better than they used to be. The stories seemed like something out of Mad Men, but they were all too real. Jane Lubchenco entered her Harvard ecology program in 1972 by being told that hers was the first class with an equal gender ratio, but that was only because the male graduate students weren't happy unless there were women around. Meg Lowman, a tropical biologist told her harrowing story: "The head of the department came up to me and he said: 'I don't know why you want to do this PhD, because you're just going to get married and have children." When pregnant with her second child during her postdoc, Sue Rosser of San Francisco State was advised by her supervisor to end her pregnancy because it put the timeline of their research project at risk.

There were stories of positive inspiration and support, too, including a different take on early life influence from Jane Goodall. She grew up on a farm and at an early age became concerned that chickens didn't seem to have a hole in their bodies big enough for eggs to come out of. She kept trying to watch chickens lay eggs so she could understand but the chickens always flew away when she approached. So, she camped out in the hen house, very still for hours, waiting for an unsuspecting chicken. One came, and she saw how it all goes down. In the meantime, her family was running all over the farm looking for their missing child. When she finally came out, her mother didn't scold her for disappearing and upsetting the family—which would have squashed her curiosity and excitement. Instead, her mother sat down and listened intently to how chickens lay eggs. That was a good reminder to me to keep curiosity alive in myself, and in my colleagues. The energy of discovery can get us through a lot.

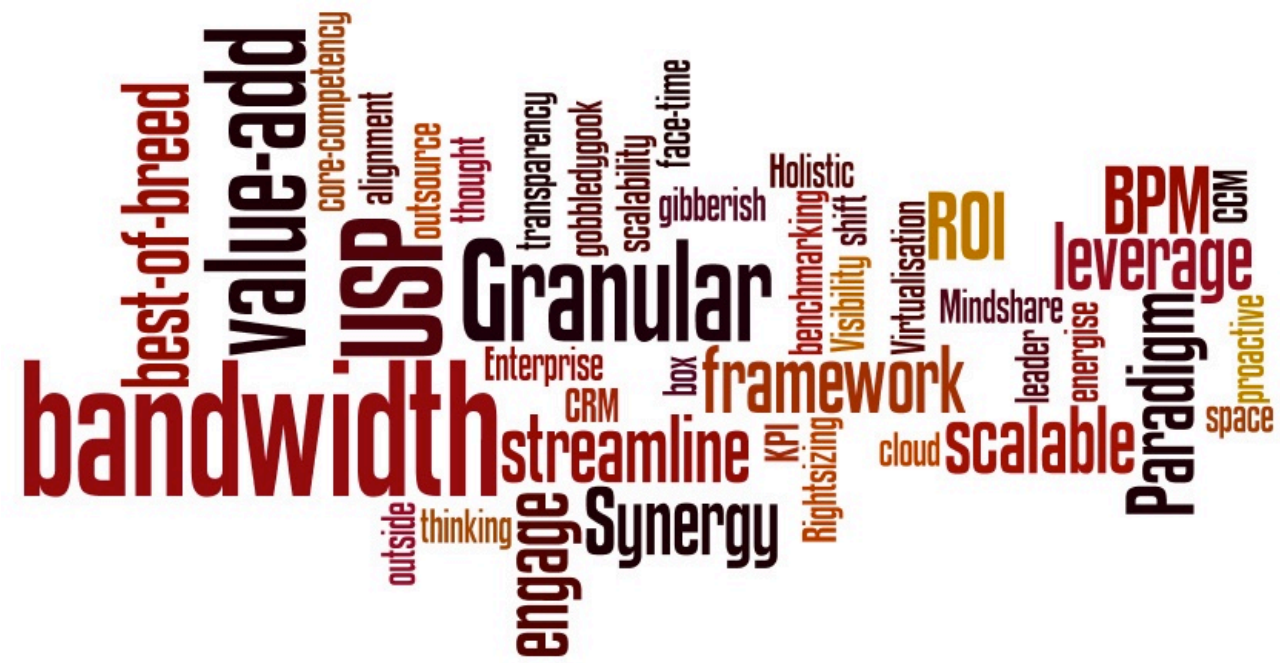
As you all know, conservation is a long game. There are few things I do on a daily basis that feel truly impactful. The Women in Science Summit was one of those things. We had great feedback, and a big following online in addition to the 200 people who joined us in the room (in fact, we were one of the trending stories on Twitter that day, besting both Trump and Kanye). This has inspired us to make this an annual event. We plan to hold it next year on the US east coast at a minority-serving institution, and the following year abroad, perhaps in India.

We still have a long ways to go, and a lot of productive conversations to foster, so please let me know if you would like to support Women in Science in any way! **SC**

Article

On Brevity and Jargon

By Tara Schnaible, Senior Usability Analyst, The Nature Conservancy



Credit: Gavin Llewellyn/Flickr through a Creative Commons license

In 1910 an ad was published, telling a profound story in six short words: "For sale: baby shoes, never worn."

If you watched the movie "Up" you know it's possible to tell an entire love story with no dialog in five minutes.

Do we have a problem? Probably. Recent internal feedback told us that our non-native English staff could barely understand internal websites because of jargon & business speak.

Why are our work products so wordy, so full of jargon and hard to understand?

Wordiness is easier than specificity. Jargon is the secret language we use to belong to our tribe.

Occasionally we need to communicate specific scientific/technical ideas, but often our writing is a consequence of unconscious communication. Many writers have explored why jargon is destructive.

Here are ways to increase clarity (& destroy jargon) in your writing:

Give up acronyms for a month (instead of carbs). Write out the full words.

Get simple.

The Literacy Project reports 50% of American adults can't read a book written at an 8th grade level (think "The Hunger Games").

Think your writing is clear? Prove it with the Flesch-Kincaid test. (For reference, this article scored grade 5.7)

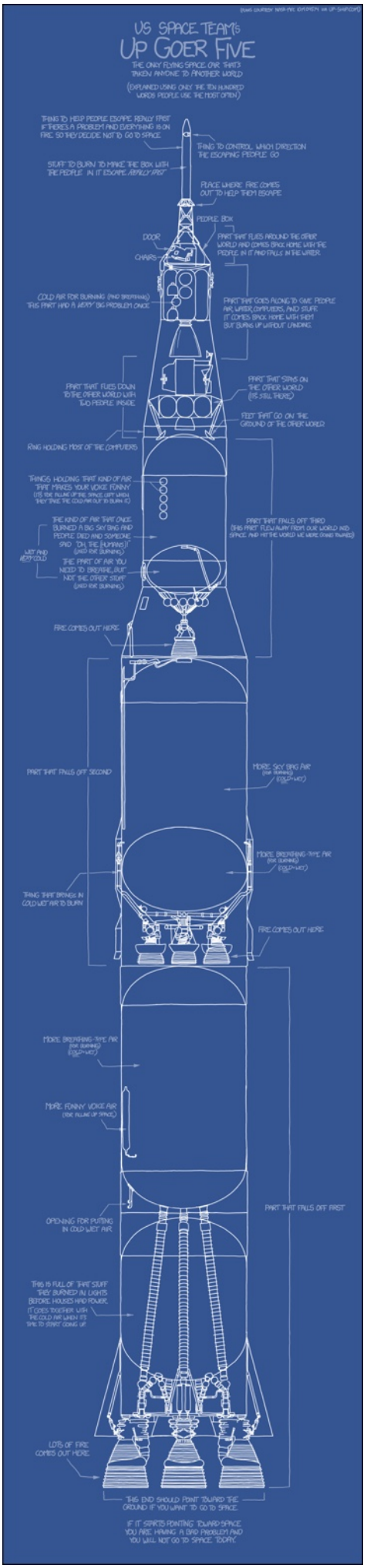
We love and hate email and you're a part of the problem. Consider picking up the phone when your emails exceed three sentences.

Lead with your strongest points. Your first sentence should be the most important one. (It's also the one most likely to be read)

Reduce words. Open any email from your Sent folder and re-write it using half the words. Set a calendar appointment to practice this daily until you're doing it without prompting.

Ask your spouse, neighbor, or friend to read your document and summarize what they understood. Brace yourself the first few times you try this.

Consider this your Spring Writing Challenge: Communicate more clearly so we can share what we know broadly, instead of only with the small group of people who can decipher the code. Be vulnerable to sounding "less smart" and to the accountability of people understanding exactly what you mean. **SC**



Further reading:

George Orwell on abuse of language
The Jargon Trap
Workplace Jargon is a Big Problem
Thing Explainer (using 1,000 words)
Embrace Brevity:
A list of "bad words"

Article

TNC's New Publications Database

By Jon Fisher, Senior Conservation Scientist, The Nature Conservancy

Reading Room, Jefferson Building, Library of Congress. Photo © Matthew and Heather/Flickr through a Creative Commons license

Nature Conservancy scientists publish almost 200 scientific articles each year. There's an impressive body of work. But how can you find these articles? We're pleased to announce that it's now easier than ever.

The Nature Conservancy, as a self-proclaimed "science-based organization," has a long history of applied science, and in using science to do conservation planning and adaptive management. Our recent evolution of "conservation by design," pushes us to better incorporate evidence into our planning. We also have many scientists on staff (including about 350 full time science and spatial analysis staff, and more than 600 staff with science degrees).

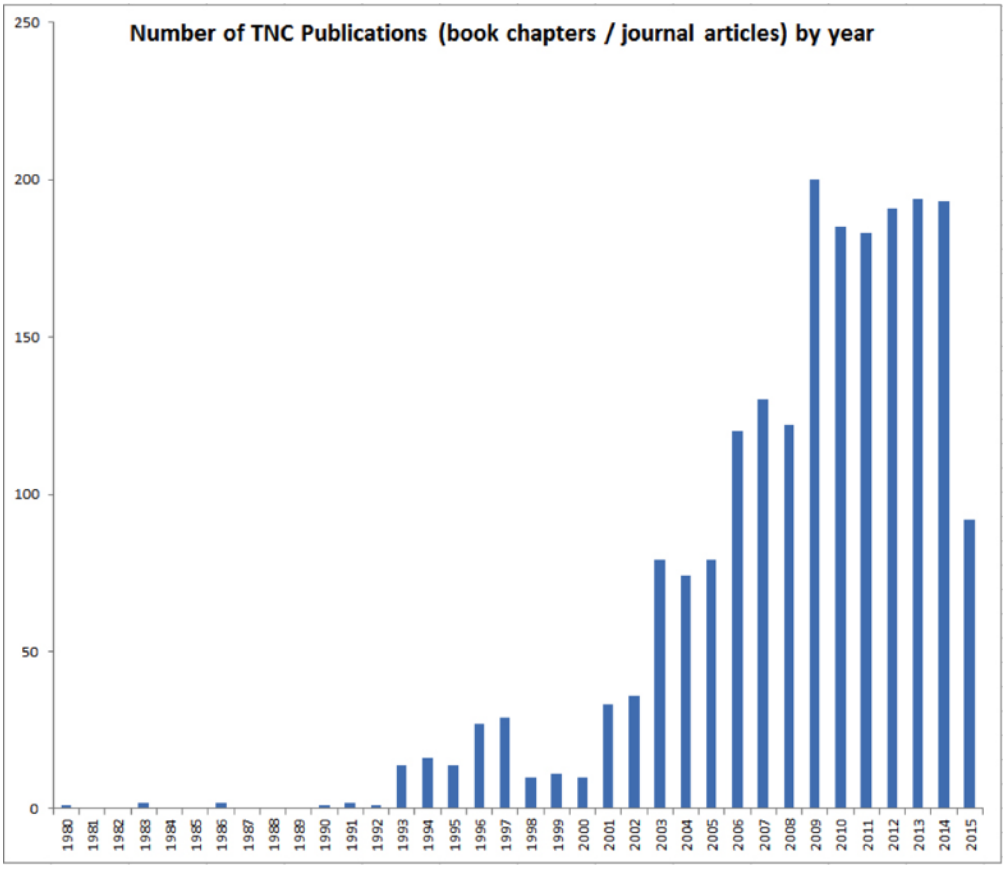
But in some scientific circles, the strength of your science is measured by your publication record in the peer-reviewed scientific literature. TNC publishes a list of recent publications in Science Chronicles. But there has to date been no way to look at the entire body of publications TNC scientists have produced over the years.

Until now. We have pulled together a searchable list of over 2,000 journal articles and book chapters authored by TNC scientists during their tenure at our organization: https://www.conservationgateway.org/ConservationPlanning/ToolsData/sitepages/article-list.aspx

You can search by author, title, journal, keywords, etc., and in many cases we provide a link directly to a pdf of the article.

This allows us to respond to the questions we regularly get about our publications: which areas of science we are strong in, who is an expert on specific topics, whether we are publishing in high-impact journals, how many publications we produce overall, etc.

One interesting finding is how TNC has really ramped up our publications in recent years. Our former chief scientist Peter Kareiva pushed hard to get TNC scientists to publish more ever since he was hired in 2002, and it appears to have had an impact, as we are now publishing almost 200 articles per year (note that 2015 looks low because we don't have all of the recent publications entered yet):



You can also see that some of TNC's publications are appearing in top journals (e.g. 35 articles in Science and Nature), and being heavily cited by other scientists. For example, a paper on marine nurseries by TNC Lead Marine Scientist Mike Beck has been cited over 1,000 times.

We hope to keep this repository current as new articles are published; we will bring in new articles as they appear in Science Chronicles. **SC**

Drinking from the Fire Hose

A quick and entirely subjective monthly roundup of interesting articles, websites and other experiences collected by your editor. Send your suggestions for future roundups to pangolin19@gmail.com.

1. A trio of interesting articles on nuclear power and its future. Is it a dinosaur in a death spiral? A symptom of climate denialism? And does it always have to cost so much?

2. If a Nobel Prize winner can do it ... Skip the journal and go straight to the internet, that is. BioRxiv, sponsored by the august Cold Spring Harbor Laboratory, offers public access to prepublication data. Follow the goings-on at #ASPAbio. #ASAPconservation would be even better. Along those lines, should NGOs go open source? Of course, and that applies to much more than source code.

3. In honor of National Women's Month (and see the article by Heather Tallis on page 16), some rules for avoiding all male panels; some more rules on how to write profiles of female scientists; and seven women who made conservation history who you may not know (and one every TNCer should). Finally, this is maddening but maybe sunlight is the best disinfectant.

4. Two out of three ain't bad. The news in February that the Supreme Court had stepped in to block the Clean Power Plan was worrisome. But a few weeks later the Court refused to block the EPA's rule on toxic mercury (oddly, two newspapers reporting on different cases used the same photo — is there only one good photo of a US coal plant?) Then the Court ended, for good we can only hope, the legal challenges to the Chesapeake Bay cleanup. And perhaps we are on the cusp of a new era on the Court.

5. Vegan Goes Vertical, which may be one way to solve this problem.

6. Because it is always worth knowing the other side is thinking (or ranting about), here's a piece on science and the Atlantic bluefin tuna that is bound to make your blood boil. Don't say I didn't warn you.

7. A political tipping point on climate change? New numbers from a Gallup poll show a shift. Last year 56% of independents saw the connection, but today fully 68% of independents agree that climate change is driven by carbon pollution. On the other hand ... **SC**

New Conservancy Publications

Conservancy-affiliated authors highlighted in bold.

Please send new citations and the PDF (when possible) to: science_pubs@tnc.org.

The complete, searchable database of over 2,000 journal articles and book chapters authored by TNC scientists is available on the Conservation Gateway.

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