

# SCIENCECHRONICLES

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Image: The world's largest gavel. Credit: Flickr user [Mary Helen Leonard](#) via a Creative Commons license.



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# Editor's Note

Dear Reader:

We know who you are.

From August 8 to September 13, we conducted a survey of *Science Chronicles*' 1,247 subscribers to find out more about who you are and what you like, or don't like, about *Science Chronicles*. We had 282 respondents (a response rate of 22%).

Here's what we found out. The average reader:

- Works in conservation or science at TNC (71%);
- Almost always reads *Science Chronicles* (54%);
- Reads *Science Chronicles* as much as when they first started reading it (57%);
- Reads more than half the articles in an issue (45%); and
- Finds the content interesting (81%) rather than boring (1%) or neutral (11%).

In the next issue we'll dive deeper into the survey results with a detailed analysis by senior social scientist Craig Leisher. And in coming months, you might see some changes to *Science Chronicles* in response to the survey's results and as part of a larger rethink of how to best communicate science internally at the Conservancy.

One thing we won't change is the level of great content about conservation science at The Nature Conservancy that you've come to expect, content such as this month's special look at how the role of stewardship is evolving at the Conservancy (see pp. 4-17).

Damon Noe kicks off the stewardship discussion with an insightful article about how things look from his perspective as a long-time land steward for the Conservancy. We asked a handful of staff to read Noe's piece in advance and write their own short responses. The seven answers we received represent a range of viewpoints from across the organization.

Thank you for filling out the *Chronicles* survey and happy reading.

— [Darci Palmquist](#), managing editor, *Science Chronicles*

## 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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# Opinion

## Stewardship Reloaded

By [Damon Noe](#), stewardship coordinator, The Nature Conservancy in New Jersey



In an October 2012 *Science Chronicles* article — [“Why Our Preserves Still Matter...and How They Could Matter More”](#) — Craig Leisher laid out a compelling argument for repositioning TNC’s many preserves to serve as both our “retail stores and living laboratories,” and challenged us to dispel false paradigms between “‘old style’ conservationists who want to do what we have always done but at a much larger scale, and ‘anthropocene’ conservationists who want to sell all the land and just work with corporations and policy types.”

While I agree with Craig that many TNC leaders are bumping up against this false paradigm — and grappling with the question of selling or keeping our many land assets — the Conservancy will always own and manage some percentage of these natural wonders. And just as we are exploring how to reposition the role of these special places to advance the [Global Challenges/Global Solutions](#) agenda, we should be thinking strategically about how to reposition our staff to serve as leaders in this new era of TNC. Global Challenges/Global Solutions is increasingly focused not just on policy and corporations, but urban conservation, diversity, volunteerism, marketing, outreach and generally making our work more relevant to more types of people.

**Image: LEAF interns on Block Island, Rhode Island.**

And who best to bring nature to life to new audiences than the naturalists, educators and frontline retailers for conservation who live and breathe our natural assets? I am talking about the old fashioned TNC land stewards — arguably the most intimately connected spokespeople for our work on the ground.

According to a survey I conducted on the stewardship listserv and direct conversations with program directors, over the past 10-15 years many state programs have chosen to covet their stewards, whereas other state programs have sent them packing, and some are still on the fence, wondering what to do. Each decision will become an experiment of its own. For sure though, there is uncertainty about the importance, relevance and utility of stewardship. This is unfortunate, dismaying, and frankly, embarrassing to those of us who do this work.

I have been a land steward at TNC for 13 years, and recently I have questioned my place here. I've had those moments out on a preserve, alone, overlooking a wonderful and magical slice of nature and pondering where and how I fit in, and thinking all the while that I have to resolve this because I love my job. The good news is, I think I may have finally figured it out.

This year I served as a [Global Coda Fellow](#) for The Nature Conservancy's [LEAF program](#), and had many opportunities to meet and spend significant time learning from stewardship staff from all over the country. These people — my peers — were so incredibly inspiring and the experience helped launch me on a critical self-reflection on the role of stewardship at TNC.

Evolution is powerful, global and rarely takes a back seat. And if we think about it as adapting to change, it does not just occur in natural systems — it's about us, too. TNC wants to be on the leading edge of conservation, but to be at the front of the pack we must be able to adjust to new-found knowledge or stressors. It is time we land stewards adapt. And we have all the skills to do just that.

Have you ever owned one of those multi-tools, the kind with the pliers, screwdriver, knife etc.? They come in handy and are wonderful for many different jobs. A land steward is like a conservation multi-tool. We can: fix a tractor, lead high end donors on fundraising trips, empower urban youth to become conservation leaders, plow a field, speak at Trustee board meetings, restore a prairie, run a boat, lead a burn crew, educate and inspire the public, impress with our vast knowledge of fascinating facts about nature, lead a corporate volunteer day, converse with all manner of people and cultures, and stand proud as we showcase our work and passion for our mission. We are the front-line retailers for conservation. How many other positions have such a breadth of knowledge, capability and experience? We are generalists, we are adaptable by nature, and we are “people people,” with a gift for relatability because we regularly live and breathe local interactions with all sorts of people.

Of course, in all of this there clearly is a premium on how good we are as communicators. My guess is the new TNC cannot afford land stewards who are not gifted communicators — so this is something we should all work on. And being a good communicator means being able to think and talk beyond the preserves we manage and

**“And who best to bring nature to life to new audiences than the naturalists, educators and frontline retailers for conservation who live and breathe our natural assets? I am talking about the old fashioned TNC land stewards...”**

it means reading broadly. Those were not necessarily what the land stewards of 1960 were asked to do. We also did not have the ever growing Digital Age then either. Now, we can share our experiences if we wish on social media, reaching thousands with a few clicks or engage with TNC's social media leaders, share experiences, photos, volunteer opportunities etc. The world loves seeing cool meaningful conservation work being done by TNC, which is great — because that's what we do.

So as land stewards, what can we do to begin to put this puzzle together?

First, we need to reassess our capacity and limit some things while giving room for new efforts. Burn-out is real and setting priorities is key to deciding what new initiatives to tackle.

Second, we need to show that we can be leaders in new conservation strategies. States like Rhode Island have turned stewardship into an affair that engages the entire community in volunteerism efforts and they have logged 5,000 hours of volunteer time each year, more than doubling land management outcomes in the state. In Georgia, stewardship engagement with LEAF is helping us identify new trustees and donors in the wealthy black Atlanta community. And in the Delaware Bayshores of New Jersey, where I work, our stewardship efforts to connect land and people resulted in a [TNC feature on the biggest news show in the country](#), NBC Nightly News, which reaches roughly 8 million viewers.

Third, we need to get better at connecting what we're doing locally to global issues.

Fourth, we need to help leadership understand and value the role stewardship can play in new organizational priorities, and integrate stewardship staff in planning these emerging strategies.

If we can adapt and better integrate stewardship into the fabric of TNC's new initiatives, we'll not only be leveraging the talented staff we already have, but we'll be strengthening our real ability to deliver on the ambitious goals of Global Challenges/ Global Solutions. [SC](#)

**“We need to help leadership understand and value the role stewardship can play in new organizational priorities, and integrate stewardship staff in planning these emerging strategies.”**

# Stewardship: Response

## TNC Preserve Managers: There's a Place for You!

By [Mark Burget](#), executive vice president & North America managing director

Thanks to generations of donors, partners and staff, The Nature Conservancy owns and manages an impressive portfolio of nature preserves. More than ever, those who manage our preserves today have an extraordinary opportunity to contribute to the future of our mission worldwide.

We at TNC have loftier ambitions than ever before. Our Global Challenges/Global Solutions strategic framework calls on us to deliver results on a scale commensurate with the challenges that face nature and people across the globe. It is not surprising that some are wondering about the role land ownership and stewardship play at TNC these days.

I believe that there are three big reasons that TNC preserves continue to offer great value to our mission:

**1. Places still matter!** TNC's land protection and stewardship contribute to the conservation of natural systems. Many of the places we protect continue to support the larger whole system conservation objectives to which we now aspire. And protected areas remain vital to our mission. I am hard pressed to think of a whole system conservation effort that does not have significant protected areas supporting broader conservation strategies.

**2. Knowledge matters; at TNC nature preserves, we should be learning, adapting, and sharing our knowledge with those whose policies and practices matter for our mission.** The lessons we learn from working within natural systems — grasslands, rivers, forests, mangroves, coral reefs — these lessons help us and others understand how to craft policies and practices for sustaining nature and people the world over. The best policies are those rooted in the learning that comes from real people living in real places. Because of our experience owning and managing preserves, we are well positioned to influence the future of policies and practices affecting our mission worldwide. Increasingly TNC has the management expertise (think fire) to leverage the conservation management of other public and private lands and waters.

**3. And people matter too! TNC preserves remain among the most effective venues for engaging others.** Each year, thousands of people visit our preserves across the United States. As we work to engage current supporters and to broaden support for our mission, TNC preserves will continue to play a critically important role. What better places for engaging the people we need — our neighbors, donors, corporate partners, politicians — than the very places where we are saving nature and learning lessons about living with the natural systems and processes that sustain people? These lands

also serve as living classrooms for volunteers and students, including students in TNC's [LEAF](#) (Leaders in Environmental Action for the Future) program.

As fully as I support our global mission and vision, I know that our work needs to touch real places and the real people who live in them. Yes, we are working, as we have for decades, to increase our global conservation impact. Yes, we are working more than ever to make the case for the value of nature to all people. And yes, just as we have for years, we at TNC have something unique and extraordinary — the world's largest portfolio of private nature preserves — to offer our cause.

If you are lucky enough to be living in or responsible for one of these places, lucky enough to be that close to nature every day, ask yourself the following questions:

1. How can we use this place to contribute to the conservation of the larger whole system of which it is a part?
2. What can we learn from this place and what can our learning teach us about policies and practices that can sustain nature over time?
3. How can we use this place to engage people, especially those who can make a giant difference for our mission close to home and around the world?

TNC preserves, and those who sustain them, have more to offer our mission than you might think. In short, our preserves matter. So, TNC land managers, if you challenge yourselves with these questions, I believe that you will remain among the most important and necessary champions for our global mission: *To conserve the lands and waters on which all life depends.* **SC**

# Stewardship: Response

## Let's Not Forget to Evolve Our Land Management, Too

By [Karen Lombard](#), director of stewardship and restoration, The Nature Conservancy in Massachusetts

I agree with Damon Noe that our stewards are multi-talented with diverse skill sets that should be put to use in new ways as TNC evolves. As Damon points out, many of our stewards now work with [LEAF](#) crews and use social media to communicate with or recruit volunteers, and are a great asset in attracting new constituencies for TNC. These opportunities, and others that will emerge as the Conservancy increases our focus on “people,” will also enable stewards to broaden their experience and provide opportunities for career growth in the often remote locations where they work.

However, in order for stewards to be able to take advantage of these opportunities, we need to implement new approaches to how we manage our ever increasing land base. Our Easement SOP and the new Fee Land Management SOP requirements, as well as other preserve management challenges and responsibilities, leave many stewards with little time to engage in the emerging priorities of Global Challenges/Global Solutions; i.e. little time to evolve. The demands on our time are compounded by the fact that our land management data is currently stored in an antiquated hodgepodge of systems and paper files. To remedy this, many stewards are “inventing similar wheels” in developing their own data collection and management solutions. There are currently limited ways for stewards to communicate and learn from each other despite the fact that their jobs are often very similar.

One way to provide stewards with more time and energy to use their broad skill sets in new areas is to improve our collaboration, increase our information sharing, and take advantage of new technologies for data collection and management.

Fortunately, there are several new and ongoing efforts initiated by field staff to remedy this situation:

- Deborah Barber at the MD Chapter has initiated the use of CONNECT for storing and accessing data as well as creating live management plans.
- The central U.S. holds a biannual stewardship conference to increase communication and information sharing.
- A regional stewardship steering committee in the Northeast (NE) is currently implementing three recommendations from the 2012 NE Stewardship Assessment that will result in a NE stewardship conference, recommended minimum standards for stewardship, and improved templates and guidelines for dealing with legal stewardship issues across TNC.
- A group of stewardship and TIS staff sponsored by the North American Region is working on a mobile technology solution for easement and fee land monitoring.

- An Invasive Species Advisory Committee was recently launched with the goal of restarting information sharing around invasive species.

More remains to be done as the NE Assessment had a total of 20 recommendations and I am sure our stewards have even more ideas to improve the way they do their jobs. Let's find ways to work together, become more efficient and effective, and free ourselves up to evolve our roles as stewards, and the role of stewardship, in our modern Conservancy! [SC](#)

# Stewardship: Response

## Pizzazz vs. Wisdom

By [Mace Hack](#), state director, The Nature Conservancy in Nebraska

We talk a lot these days about leverage, especially in the realms of government policy and corporate behavior. Ideally we test a concept, demonstrate its success, and get others to replicate it at scale. At least with terrestrial systems, leveraging our efforts to achieve long-term success depends utterly on changing the behavior of other landowners. Our preserves, and our land stewards specifically, give us the credibility to ask others to change what they're doing.

I work in farm and ranch country, in a state with less than 3% of the land belonging to the public. Parachuting in from Arlington with a great idea for landscape change won't get much done on the ground. A land steward with trusted community relationships so that people will listen, and a preserve to showcase the great idea so that people can see that it works in their area, present a much more effective means of leveraging our efforts.

That doesn't mean that we should hang on to all our preserves. If we cannot be exemplary stewards, and the example we set doesn't resonate with the people we're trying to impact, then it's best to find a caretaker other than TNC.

Where do we start? We ask our land stewards to lift their heads and look beyond their preserve's boundaries to recognize the larger system they're a part of, identify the big issues degrading biodiversity and ecological function at the system scale, and re-orient the work on their preserve to address these issues. For this task, give me one of Damon's "multi-tool" stewards, adaptable by nature and open-minded in seeking opportunities for change, for change is the norm for us at TNC.

To Damon's point about land stewards in the "new" TNC needing to be gifted communicators, it's important to ask first: Who do we most want our stewards to influence? Donors and politicians might respond best to the pizzazz of a gifted communicator, able to translate science, practice and vision into clear language and a concise message. But if ranchers are your target audience, I'll take that thoughtful and quiet land steward in the corner who speaks better rancher. Pizzazz comes with personality, while wisdom comes with experience; you have to earn it.

For me, the most chilling sentence in Damon's piece is this: "Recently I have questioned my place here." If we cannot hang onto our experienced and multifaceted land stewards, those who have earned the wisdom of making our lands flourish ecologically, we risk losing a major part of our credibility with the audiences we most need to influence. **SC**

# Stewardship: Response Innovation Fund for Land Stewards

By [Craig Leisher](#), senior social scientist, The Nature Conservancy

Too often we see our preserves as runs on the board, how we keep score, but less as working assets. Our preserves are the most under-utilized assets on our balance sheet. We tend to under-brand, under-market and under-staff our preserves. The Conservancy's preserves are our natural capital, but they could provide much higher rates of return.

As I noted in the [October issue](#), ultimately all conservation is retail and not wholesale, and Conservancy preserves are our retail stores. It's where we show what we do. Our preserves offer more than 1,200 locations to introduce people to our pragmatic approach to conservation. They are great places to test a new approach or launch a new initiative. They are also the perfect places for introducing the kids in your life to nature.

But let's turn up the amperage and better integrate land stewards into our global priorities as Damon Noe suggests. One of the strengths of the Conservancy is the innovation that happens at the local level. What if we had a small fund to encourage innovation among our land stewards? Create an incentive for land stewards to try new ideas and build new links with the Global Challenges/Global Solutions. We have 1,200+ potential innovation incubators. Let's use them more. **SC**

# Stewardship: Response

## A New Breed of Stewards

By [Scott Comings](#), director of land and freshwater conservation, The Nature Conservancy in Rhode Island

In my almost 17 years working at The Nature Conservancy, one of the major constants has always been change or, as Damon Noe writes in his article, evolution. Often this process is not easy but it is vital for our organization to continue to do good conservation and remain relevant in a changing global community. I completely agree with the direction that Damon has identified for the traditional land steward.

In Rhode Island, we began employing this philosophy two and a half years ago and it has transformed our program and been a successful experience. The recent *An Assessment of The Nature Conservancy's Stewardship Programs in the Northeast United States* showed that from 2000 to now there have been significant changes in our chapter's stewardship staff, which has been reduced by 34.5%, while our land holdings rose by 226.5%. This would seem like a recipe for disaster but instead it led to a new (or old, depending on how long you have been at TNC) paradigm. The use of volunteers in Rhode Island has replaced our lost capacity and then some by building a robust volunteer network. Our trustees and donors comment regularly that our preserves have never looked better.

Our stewardship staff have been transformed into volunteer coordinators, educators and, most importantly, the on-the-ground communicators about our work. There are countless examples where steward communication led to new donors, better property management on abutting properties, greater knowledge about the environment and a stronger connection between TNC and the communities we work.

I believe our flagship preserves and this new breed of steward will play an important role in the implementation of Global Changes/Global Solutions and the Conservancy's overall success going forward. **SC**

# Stewardship: Response

## Connecting to the Next Generation

By [Brigitte Griswold](#), director of youth programs, The Nature Conservancy

The [LEAF](#) Program would not exist without the passion and dedication of stewardship staff across the country, and I for one am extremely grateful for the folks that share their knowledge, time and commitment to conservation with the next generation.

The number one reason we have such high numbers of urban youth that go on to pursue career paths in conservation (at rates almost six times higher than the national average) is because these young people work, learn and live alongside stewardship staff whose passion for their work is LITERALLY contagious. You cannot find that kind of influence or inspiration in a lesson plan. That comes from authenticity and a deeply personal relationship with natural places, and a desire to share that passion with others.

What is even more inspiring to me is watching the reciprocity of the relationships between stewardship staff and urban youth. When stewardship staff see their own work in expanded ways — as educators, mentors, and role models — through the lenses of the young people who truly value them in this way... well, that is just simply magic.

I commend Damon for this piece, and for the courage and sincerity with which it is written. **SC**

# Stewardship: Response Preserves vs. Policy: Let's Move the Discussion Toward Goals

By [Scott Simon](#), state director, The Nature Conservancy in Arkansas

Craig Leisher writes that our preserves matter and could matter more if they were given a new role to play by answering research questions and demonstrating how nature benefits people. Damon Noe writes about strategically repositioning stewardship staff as front-line communication retailers for conservation given their breadth of knowledge, capability and experience. I like their positive viewpoints.

I hear about a dichotomy between preserves and stewardship versus conservation policy. I believe it is a false dichotomy. Integrated efforts within the Conservancy are much more common than people might realize. Over the last 15 years of my experience, the science of conservation has evolved, our conservation strategies have evolved, and the roles and responsibilities of stewardship and conservation staff have evolved to accomplish our landscape conservation and policy goals. We are doing this throughout the Conservancy.

We have learned that the most successful large-scale policy strategies require a connection to places. This is a fundamental part of any strategy plan. We have learned that policies that don't have a connection to real places often go nowhere. I have had the honor of working with functionally diverse teams to raise two \$10 million+ gifts and advance national strategy initiatives that included improved public policies and more than \$100 million for conservation priorities. Each successful strategy implementation involved critical trips to Conservancy preserves in beautiful settings where TNC staff and partners showed our visitors the proven conservation actions we wanted to expand into a broader landscape of public and private lands and waters. Nothing speaks as clearly as on-the-ground results.

These successes are based on deep, long-term partnerships that built a constituency around changes in practice, and they are centered on places.

I would suggest rephrasing the issue around a central question: How do we build the staff teams, partnerships, and constituencies needed to accomplish our strategy goals and how do we identify and train staff to accomplish them?

The Conservancy chapter I have the pleasure of working in, Arkansas, has a long history of preserves and stewardship. But our stewardship staff spends 80% of its time on other people's property — working with our agency partners and private landowners to accomplish our mutual conservation goals. The focus is not about preserves, preserve management or stewardship staff; it is about achieving the strategy goals.

The goals, strategies and initiatives within TNC's North America plan, the previous white paper, and many previous plans and initiatives are filled with opportunities for utilizing the Conservancy's preserves and stewardship staff to advance policy strategies.

There are a multitude of successful examples of integrating places, stewardship and policy. These are a few of the ones that I know about:

- The long-leaf pine restoration work of several southeastern TNC chapters on preserves has led to a multi-partner, range-wide plan that has exponentially increased funding and accomplishments on partner lands.
- A network of forest restoration (prescribed fire and ecological thinning) projects on TNC and partner managed demonstration sites across the U.S. (with additional work in Mexico, Honduras and East Africa) has led to substantially increased funding and practices on millions of acres of public forestland and grasslands.
- Stream restoration demonstration sites in multiple states are effectively being used by state and federal agencies to update practices to improve the health of river systems.
- Understanding individual Ozark karst preserve recharge areas led to a region-wide Karst Area Vulnerability Estimate map that has turned into regional growth and development plans that have focused development away from ecologically sensitive areas.

Many chapters are using a more integrated approach. I am going to use an unconventional example to illustrate it: Improving unpaved roads Best Management Practices. (Apologies to my colleagues for my erroneous oversimplifications of the approach and example!):

1. What is the strategy goal? Example: Reduce sediment from unpaved roads entering freshwater streams by 65%.
2. What is the strategy plan to achieve it? Work with county leaders, public land managers, industry and others to improve unpaved road construction and maintenance practices.
3. How is the desired practice going to be developed? Test unpaved road Best Management Practices (BMP) on TNC land first and then on partner lands. It has been easier to begin a practice on a place we own before testing on other partner and private lands.
4. How is the improved practices information going to be shared? Hold workshops and field tours on unpaved roads BMPs with partners, and develop a suite of interpreted demonstration sites.
5. How is the policy goal going to be achieved? Develop the partnership and constituency. Integrate BMPs into county roads departments and partner land management plans. Pass legislation that prioritizes funding, and develop a cost share-funding program for local governments and private landowners. As Craig Leisher describes, the underlying theory of change is that policy makers

respond well to organized groups of constituents championing a better “mousetrap.”

6. What are the TNC staff roles? Determine the skills and experiences needed to accomplish the demonstration site development, the targeted training and outreach, and the public policy change. Hire and/or train the staff to accomplish the strategy goals. In our case, existing staff developed the strategy, received training from experienced State of Pennsylvania partners and gained experience by designing and implementing unpaved roads BMP construction on TNC preserves and partner properties in Arkansas. This gave them the background needed to develop and implement the strategy more broadly into adjacent states.

It seems like it is time for the discussion to move from the analysis of a false dichotomy of preserves and stewardship versus policy to developing the strategies, functional teams, demonstrations, partnerships and constituencies needed to achieve our conservation goals.

Ultimately our success has been and will be defined by leadership. In the Conservancy, leadership is found in many places. I believe more stewardship and policy staff will pull together to develop quality strategies with partners, utilize our places as appropriate demonstration sites, and support the partnerships that share the practices with others in many creative ways — to accomplish the Big Conservation Wins that we know are needed. Thank you. [SC](#)

# Too Much Data, Too Little Time: Evaluating the Relationships Between the Success of Salmon and 58 GIS Variables

By [Jeanette Howard](#), associate director of science, The Nature Conservancy in California; [Jeffrey S. Evans](#), senior landscape ecologist, The Nature Conservancy; Kurt Fesenmyer, GIS specialist, Trout Unlimited



California's wild salmon populations rank among the most depleted across their Pacific range. Today, 13 of the 21 anadromous taxa found in the state are in danger of extinction (Moyle et al. 2008). Numerous factors have been implicated in their decline, such as reduced and altered flows, destruction and modification of habitat, alteration of landscapes, overfishing, climate change, water quality, and non-native predator or competitor species — factors that are often summed up as the 4Hs: harvest, hatcheries, hydropower and habitat, and in many cases are documented at fine spatial scales.

Rapid advancements in GIS and remote sensing technologies have provided us with huge amounts of potential data related to these 4H factors. With so much data, we can easily find ourselves at a loss as to where to begin to make sense of them. How do we identify the most important factors influencing the health of salmon? If we throw, say, 60 variables into a multiple regression model, will it tell us any more than if we threw those variables at a wall? Are traditional statistical frameworks the right way to analyze our data?

In this study we deal with the issue of having a slew of data related to predicting the success of coho salmon. We develop a methodology for assessing 58 spatial variables

**Image: A salmon makes a run up California's Battle Creek to spawning grounds. This salmon most likely originated in the San Francisco Bay Area and traveled up the Sacramento River. Image: Ian Shive.**

associated with the health of coho salmon populations in California, with some surprising findings — variables tied to climate, such as water temperature, are more important to population integrity than those tied to people (i.e., habitat alteration).

### Here's what we did:

One of the best existing frameworks for analyzing the considerable and often disparate data on salmonids is the Conservation Success Index (CSI), developed by Trout Unlimited to support comparisons among salmon runs and across administrative boundaries (Williams et al. 2007). The CSI comprises a series of spatial watershed-scale summaries that score the indices within thematic “indicators” reflecting the best understanding of how those data likely affect the integrity of salmonid populations across their ranges. In fact, we used the CSI to develop California’s “Salmonscape,” — a portfolio or ecoregional plan for our California salmon initiative.

Yet the CSI could still not help us answer the deeper question we wanted to answer: What factors are actually driving the success or failure of coho salmon (*Oncorhynchus kisutch*) populations across their range in California? We teamed up with Trout Unlimited to explore that very question.

Using the existing CSI information as a foundation, we built a spatial database of 58 watershed-scale variables for all sub-watersheds in California that historically supported runs of salmon or steelhead. This database included 38 variables related to the human footprint, 17 variables related to abiotic or climatic condition, and 3 variables related to coho distributions (e.g. miles of stream currently occupied, miles of stream historically occupied, etc). So in total, we had 58 variables potentially impacting salmon populations.

We derived a ranking of “population integrity” from scores generated by salmon experts based on factors such as population abundance and productivity, genetic condition, and life history diversity (Wild Salmon Center 2010). Populations were scored on a 1 (worst) – 4 (best) scale with a 0 value for extirpated populations. The population integrity score served as our response variable and allowed us to statistically explore the question of what suite of environmental and anthropogenic factors contribute to the most viable coho populations (i.e. score = 4).

We then utilized the Random Forests (Breiman 2001a, Evans et al. 2011) model to identify the subset of variables (of the 58 variables) most important to coho population integrity, using the model selection approach described in Murphy et al. (2010). Random Forests is a predictive model used to identify variables that are predictors of a given outcome. This model uses a principle called “weak learning” — an approach that iteratively subsets the data inputs and fits a series of “less than optimal” models. Through the process of iteration the best model is converged upon.

**“Yet the CSI [Conservation Success Index] could still not help us answer the deeper question we wanted to answer: What factors are actually driving the success or failure of coho salmon (*Oncorhynchus kisutch*) populations across their range in California?”**

Because data are left out of each model iteration, we can test against the withheld data. This provides several “byproducts” including an assessment of model performance/error and the ability to test the contribution of each variable via random permutation, using reduction of error, to rank variable contribution. The model with the lowest error and fewest variables is selected (Murphy et al. 2010). We used the best model as a starting point for exploring variable importance for each population integrity score at both global (across all population integrity classes) and local (single class) model effects.

### What did we find?

Of the 58 variables we started with, 15 strongly influenced coho populations across their range, where 6 variables strongly influence local variability and 9 are more global in nature (see Table 1 below). Table 1 shows the variables important to the 5 coho population integrity scores and the frequency at which those variables occur. Nearly all the selected variables are climate factors, with the exception of 2 related to anthropogenic disturbance (miles of stream listed on the 303d list for sedimentation and the count of downstream partial barriers), and 1 variable related to proximity of the sub-watersheds to the Pacific Ocean.

The most universal variable found in all models, regardless of population integrity class, was Base Flow Index — a measure of the percentage of streamflow that can be attributed to groundwater inputs into streams (Wolock 2003). This suggests that viable coho populations are influenced by cold, groundwater inputs. Given that coho salmon are highly temperature dependent, this finding makes a lot of sense and points to the importance of maintaining cold water refugia for this species.

A suite of climate variables, including the amount of upstream winter precipitation, the upstream growing degree days, and the percent of local and upstream annual precipitation that occurs in the winter, and the miles of stream between the sub-watershed and the Pacific Ocean are important to nearly all of the models. The most viable populations are located close to the ocean, have among the highest amounts of winter precipitation in the study area, have moderate growing degree day totals in their upstream sub-watersheds (not too hot, not too cold, just right?), and have less than 50% of their total annual precipitation falling during the winter.

### Here’s why it matters:

The importance of climate factors in coho population integrity may suggest that perhaps the most important strategy for coho conservation is the protection of the strongest populations. Given that very few of the selected variables in our models are related to anthropogenic influences, restoration of human disturbances alone is not likely to be sufficient for bringing back coho populations in areas where climatic conditions cannot support the most viable populations. The results don’t suggest that anthropogenic influences to aquatic habitats and species are not affecting species success on the ground. For example, we know that specific restoration actions like

**“Given that very few of the selected variables in our models are related to anthropogenic influences, restoration of human disturbances alone is not likely to be sufficient for bringing back coho populations in areas where climatic conditions cannot support the most viable populations.”**

removing a barrier and opening up 1 mile of new habitat for spawning can result in meaningful responses of fish populations. But in a world of limited restoration dollars, our findings suggest those funds are best spent on the most viable populations, which we show currently occur within a specific climatic window (i.e. that 1 mile of new habitat is likely to produce more fish in a population that is more viable now).

Coho in California are at the periphery of their range. The results here suggest that recovery strategies should consider current and future climate conditions, and may want to focus on protecting those places with cold water inputs that act as refugia for coho. Prior to using Random Forests to evaluate these factors, we would have expected anthropogenic influences to be driving coho population integrity.

The beauty of models such as Random Forests is the capability of accounting for very large complex, nonlinear data spaces as well as unknown variable interactions. For example, Evans et al. (2011) found that many variables interact in nonlinear ways to influence the suitability of the environment for different plant species, and that responses to climate change can be species specific. This finding contradicts the notion that vegetation communities respond to climate change in unison. Such may be the case for different species of salmon.

The structure of the Random Forests model is hierarchical in nature and as such, both global and local variation are accounted for and reflected in the variable importance measures. Because of the nonparametric nature of the model, concerns such as autocorrelation, independence, normality and overfit are minimized.

Due to this minimization of assumptions and the ability of the model to account for complex nonlinear interactions, it is relatively easy to implement. However, the field of nonparametrics is only now starting to expand from optimal prediction to inference (Breiman 2001b, Baruch-Mordo et al. in press, Murphy et al. 2010) making approaches like ours quite novel. **SC**

**“Coho in California are at the periphery of their range. The results here suggest that recovery strategies should consider current and future climate conditions, and may want to focus on protecting those places with cold water inputs that act as refugia for coho.”**

**Table 1. Frequency column shows the number of times a given variable is ranked in the upper 0.75 range of importance for the global model and each population integrity score. This effectively tells us if a given variable is important across multiple viability classes or a limited subset (or even a single class as in score 3 and Mi\_303tmp). Note that the table only shows variables important for the low and high population integrity scores.**

| Variables   | Global model | Population Integrity Score 1 (Low) | Population Integrity Score 4 (High)                   | Frequency |
|---|--------------|------------------------------------|---|-----------|
| Downstream Barriers                                   | .            | Downstream Barriers                | .   | 2         |
| Mean annual precipitation locally                     | .            | .                                  | Mean annual precipitation locally                     | 2         |
| Mean annual precipitation upstream                    | .            | .                                  | Mean annual precipitation upstream                    | 2         |
| Mean annual precipitation occurring in winter locally | .            | .                                  | Mean annual precipitation occurring in winter locally | 2         |

|   |   |   |   |   |
|---|---|---|---|---|
| Mean annual precipitation occurring in winter upstream            | Mean annual precipitation occurring in winter upstream            |   | Mean annual precipitation occurring in winter upstream            | 3 |
| Mean winter temperature locally                                   | 4 |
| Growing degree days locally                                       |   | Growing degree days locally                                       | Growing degree days locally                                       | 4 |
| Mean winter temperature upstream                                  | 5 |
| Growing degree days upstream                                      | 5 |
| Proportion of annual precipitation that occurs in winter locally  | Proportion of annual precipitation that occurs in winter locally  | Proportion of annual precipitation that occurs in winter locally  | Proportion of annual precipitation that occurs in winter locally  | 5 |
| Proportion of annual precipitation that occurs in winter upstream | Proportion of annual precipitation that occurs in winter upstream | Proportion of annual precipitation that occurs in winter upstream | Proportion of annual precipitation that occurs in winter upstream | 5 |
| Miles to ocean  | Miles to ocean  |   | Miles to ocean  | 5 |
| Base Flow Index locally   | 6 |
| Base Flow Index upstream  | 6 |

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# Tara Schnaible & Dan Majka

## Designing Your Day for Optimal Cognitive Output

By [Tara Schnaible](#), usability analyst, and [Dan Majka](#), senior cartographer/analyst, The Nature Conservancy



We recently renovated my office and the new toilet paper holders are destroying my best work.

Insane idea? Maybe.

The signs something was wrong came early: within a week of installing them, no one would replace the toilet paper when the roll ran out. Within a month, the cleaning crew gave up putting new rolls on. Multiple times a day I'd find both rolls empty, have to sacrifice a chicken and run a half-marathon (effort-wise) to replace the rolls BEFORE doing anything else. At first I thought, "One Conservancy ... I'll write this into my objectives next year," but slowly I grew to loathe the designer of this terrible device, and wonder if they hadn't given them away for free when it came to light how un-usable it truly was.

To quote [an excellent cognitive-behavioral article](#), "Willpower and cognitive processing draw from the same pool of resources." The implication of this study is profound: You have a limited ability to exert willpower and think critically every day.

This means, *every time I exert my cognitive energies on the toilet paper holder I sacrifice cognitive quality in my actual work.* The broader lesson is that these daily, small moments impact the quality of our work.

**Image: A few rolls of toilet paper can ruin your work day. Image credit: Flickr user [Joe Plocki](#) via a [Creative Commons](#) license.**

In an effort to exert as much excellence toward achieving our mission, I propose we banish these invisible thieves. Instead, design your day to do your best work.

Here are some ideas to get you started:

- **Refill the Cognitive Well (Eat snacks more often).** The brain [consumes more energy](#) than any other organ of its size. Studies have demonstrated connections between cognitive energy, the amount of snacking they do and the rate of granting parole. **Lesson:** Eating throughout the day will increase your ability to think critically.
- **Stop Holding Back in Meetings.** Holding back anger, disagreement, and emotion [will not only impact your health negatively](#), it leads to additional meetings to eventually discuss the disagreement once it comes to the surface. Learn [better ways to disagree/critique](#) and you will improve your work on those days. **Lesson:** Practice being true to yourself: just say it.
- **Big Words/Jargon/Acronyms.** In the course of becoming experts in our professions, we learn the words to better describe how we work, ideally to become more efficient. Jargon mostly obscures meaning. [Use this calculator](#) to estimate how “readable” your last email was. The more effort someone spends reading your communications, the less effective they are at their job. **Lesson:** Use simple, clear language in your communications.
- **No One Can ACTUALLY Multi-Task Well.** Most [people can reasonably focus on two tasks](#) at any given time. Close down Outlook when you need to focus on work. Exerting self-control while Outlook is open will sap your energy for real work. Can’t escape the world of multi-tasking? [Practice better focus](#). **Lesson:** Limit the number of things you work on simultaneously to 1 or 2.
- **Think Once, Not 100 Times.** Look at your daily habits and choose how you’ll exert that beautiful brain of yours. [Effective dieters](#) put healthy snacks in their desk so they don’t **have to** tap willpower to resist the cake in the kitchen. Replace the demonic toilet paper holder. Protect yourself and your time: from [counter-productive people](#), or tasks that sap your energy. Shut off your cellphone/iPad/e-whatever during meetings so you can focus fully on one task. **Lesson:** Reduce unnecessary thinking, emotions, and temptations.

Save your energy for “saving the world.” (And don’t buy the Bradley 5236 double roll holder.)

“The implication of this study is profound: You have a limited ability to exert willpower and think critically every day.”

## 15 Seconds of Fame

### Colin Shanley

GIS analyst and conservation planner Colin Shanley spends weekdays doing “creative science” for the Conservancy in Alaska. On weekends, you might find him salmon fishing, backcountry skiing or otherwise enjoying the wilderness right outside his front door.



**Image:** Colin Shanley with a coho he caught in southeast Alaska.

**MY JOB:** My official job title is GIS analyst and conservation planner. We’re a small office here in Juneau. I’m a one-stop shop for project design, data analysis, outreach, write-ups. I spend most of my time in the office working on data and research projects.

**READING:** I just finished *The Blue Bear* by Lynn Schooler. He’s a local guy. I have to say I was skeptical at first — they made a play about it and I didn’t really get it. But the book was good. I’m a sucker for memoirs, and Schooler has led an interesting life.

**OFF-HOURS:** My favorite thing in the whole world is backcountry skiing. Spring is the best time for that, we get tons of snow. You can hike up and ski anywhere you want here. Summer is pretty good, except some years it rains a lot so you need to plan trips somewhere sunny to dry out if you can. I’m also big into trail running, sea kayaking, deer hunting — just getting some fresh air every day.

**MOVING IN:** I just finished building a house this spring. I designed and engineered it with friends and worked with a local contractor to build it. It was a lot of work but rewarding to do it all myself. It’s small, 1,200 square feet. It’s pretty cool, it’s a little piece of art. It’s in one of the oldest neighborhoods in Juneau on a lot that no one

thought was buildable — steep and rocky, all bedrock. The neighborhood is right above downtown, so I can walk to work.

**SALMON:** I try to get out salmon fishing a couple of times a year. The coho are running now, so I'll deckhand on the weekends for a friend who's a commercial fisherman. I used to sport-fish a lot, but when you go out with commercial boats you can catch hundreds of fish at a time.

I just finished a research project where we developed a climate change vulnerability index for salmon in southeast Alaska based on hydrologic modeling. We looked at change and potential for floods and scouring events. Studies suggest one of the biggest threats to salmon in southeast Alaska will be greater frequency of high flow events that kick eggs out of the gravel in winter. We modeled which watersheds are more susceptible to these and overlaid that with areas of high salmon abundance.

**TRENDING:** In my own little corner of the world, [Pebble Mine in Bristol Bay](#) is the biggest issue. But I think it is also a test case for Alaskans and the U.S. The science is showing that we're going to have to choose between minerals and fish. It's brought a lot of interesting people together on all sides of the debate to discuss what are our values, what are we willing to risk.

What makes the problem tricky is we're dealing with an aquatic system and things can get messy in aquatic systems real fast. Mineral extraction could do everything exactly right to make it as safe as possible, but if something goes wrong it all goes downstream.

**LIFE AT 58°18'0"N 134°25'0"W:** Juneau has a population of about 35,000 people, it's the state capitol, we have a great little university and there's quite a showing of natural scientists here. There are no roads to Juneau — to get here you have to take a ferry or plane. A lot of folks are into subsistence activities. Overall it's a fairly progressive place. I love it. It's a tight little community with a real downtown on a wild piece of coastline.

Juneau was initially founded as a mining town and mining is still the biggest private employer here. Another huge part of the economic engine is the cruise ship industry — we get a steady stream of cruise ships all summer long. Juneau struggles with its identity a bit. What do we want to define ourselves by — mining and tourism — or are there other areas we want to invest in?

**LOVE MY JOB:** I like to do creative science. GIS is my tool to ask questions that I'm interested in and to come up with spatial solutions. I came from habitat modeling and that's evolved into climate analysis and multi-use analysis. Part of what gets me fired up is being encouraged to come up with innovative solutions or to try something that's never been done before. **SC**

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

## Science Short

# The Social Media Counter Movement

Stieger, S., C. Burger, M. Bohn, and M. Voracek. 2013. [Who commits virtual identity suicide? Differences in privacy concerns, Internet addiction, and personality between Facebook users and quitters](#). *Cyberpsychology, Behavior, and Social Networking*. 16(9): 629-634 doi:10.1089/cyber.2012.0323.

Social media — you can love it, you can hate it, but you can't avoid it. Or can you?

Even as more and more of the world is signing up and tuning in to social networks like Facebook and Twitter, there's a growing counter movement of people who have given it a try and decided to exit the playing field. Termed "virtual identity suicide," this movement has been aided by efforts like Quit Facebook Day and The Suicide Machine, the latter of which helps delete all your social media presences if desired.

The primary motivation of the movement seems to be privacy concerns, say the authors of this study. They investigated whether Facebook users are different from Facebook quitters across three categories: concerns over privacy; levels of Internet addiction; and personality (extraversion, agreeableness, conscientiousness, neuroticism and openness to experience).

The authors found, not surprisingly, that Facebook quitters are more cautious about privacy than users. But an unexpected finding was that Facebook quitters tend to have higher levels of both Internet addiction and conscientiousness, two traits that generally don't go together according to previous research. Facebook quitters are also more likely to be men and tend to be older than users.

What does this all mean for you? Well, if you've given social media a try and decided it's not for you, take comfort in knowing you aren't alone. But before you do so, consider this other relevant study that found [tweeting about scientific research can actually help increase its reach and impact](#). SC

—**Darci Palmquist**, senior science writer, The Nature Conservancy

## Blog Reel

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

“Bats eat scorpions? How is that possible? Here’s the pallid bat story. It’s far weirder than you imagined.”

— Craig Leisher in [A Bat that Eats Scorpions](#)



Image: The often-heard common true katydid (*Pterophylla camellifolia*). Photo: Lisa Brown (Flickr user meanandpinchy) under a Creative Commons license.

“The real value of the Penobscot’s example may be for countries that are just now beginning to plan and build dams.”

— Jeff Opperman in [Penobscot River Dam Removal: Lessons for a World Demanding Energy](#)

“Could restoring oyster reefs combat nitrogen pollution? And if the answer is yes, could that service generate enough funding for broad-scale oyster restoration?”

— Jonathan Adams in [Research: Can Restoring Oyster Reefs Combat Nitrogen Pollution?](#)

“Despite their ubiquity, they don’t have the same following that birds do. (Hipsters take note, perhaps “katydiding” is the new birding?).”

— Jon Fisher in [Citizen Science: Survey Katydid in Your Neighborhood](#)

“On Prince of Wales Island in Alaska, the restoration of rivers goes hand-in-hand with the restoration of cultural traditions.”

— Matt Miller in [In a Remote Alaska Rainforest, a Tribe Protects Habitat and Restores Culture](#)

## Announcements

### Science Innovation and Achievement Award

By Peter Kareiva and Bill Ginn

TNC has always been science-based, and many of TNC's most effective conservation strategies have come out of science advances. These include everything from environmental flows, to water funds, development by design, and coastal resilience. We are launching a new annual award to recognize scientists at TNC who exemplify science innovation. Candidates can be nominated by any senior manager within TNC and the nominating senior manager need not be a supervisor of the person they nominate. The criteria used to select the winner entail innovation, publication, and potential (or realized) impact.

The nomination should consist of a short letter (one page) that indicates why the science is so important, as well as a copy of candidate's resume and PDFs or links to one or two publications that report on the scientific foundations behind the contribution. The nominations will be reviewed by the Chief Scientist and the Chief Conservation Officer, who will jointly make the decision. A modest monetary award of \$2,000 will accompany the recognition.

**Submissions due September 30.**  
SC

### December 10-12, 2013: All Science Conference for Nature and People Santa Clara, CA

Submitted by Ryan Surber

Conservation today demands working in landscapes and seascapes that cross the spectrum of human uses and impacts, and range from local to global scales. The Nature

Conservancy's Global Challenges Global Solutions framework provides an approach for working across those systems and scales to advance conservation for both nature and people. Science is integral to that approach. In December 2013, the Conservancy will convene conservation scientists, philanthropists, and environmental thought leaders to explore the existing science and explore innovative ways to select and design transformative conservation strategies, advance conservation efforts, and measure the effectiveness of investments in conservation. The 2013 All Science Conference for Nature and People will give us an opportunity to discuss, debate, and advance the science foundations of conservation in the 21<sup>st</sup> century.

This 3-day conference, hosted by TNC Lead Scientist Heather Tallis and Chief Scientist Peter Kareiva with local host Scott Morrison, will feature plenary sessions by CEO and President Mark Tercek, and CEO and President of the Wildlife Conservation Society, Dr. Christian Samper. In addition, TNC and guest scientists/practitioners will hold sessions on innovations in field work and advances in conservation. Please [submit presentation proposals](#) for consideration by the All Science conference committee. **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.

**Baruch-Mordo, S., J.S. Evans, J.P. Severson, D.E. Naugle, J.D. Maestas, J.M. Kiesecker, M.J. Falkowski, C.A. Hagen, and K.P. Reese.** 2013. [Saving sage-grouse from the trees: A proactive solution to reducing a key threat to a candidate species](#). *Biological Conservation* 167: 233-241.

**Bowden, A.A.** 2013. [Towards a comprehensive strategy to recover river herring on the Atlantic seaboard: lessons from Pacific salmon](#). *ICES Journal of Marine Science*, doi:10.1093/icesjms/fst130.

Hutchison, J., A. Manica, R. Swetnam, A. Balmford, and **M. Spalding**. 2013. Predicting global patterns in mangrove forest biomass. *Conservation Letters* doi: 10.1111/conl.12060.

Meijaard, E., **C. Leisher, E.T. Game, and C. Groves.** 2013. [Think before you plan: Introducing preplanning considerations in conservation](#). *Journal of Indonesian Natural History*, 1(1), 21-30.