Leveraging Innovation to Boost Private Investment in America's Natural Resources

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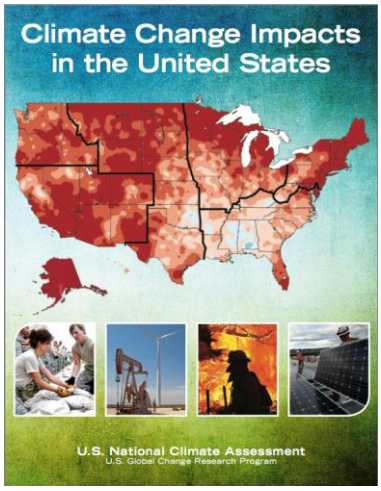
INTRODUCTION

Private and philanthropic investment is an important tool in the conservation toolbox. By increasing innovation across three areas – policy, finance, and technology – more of this capital can be brought off the sidelines and into the game. This will help us take on the challenge of securing our natural resources and environment for future generations, a challenge made more difficult by the growing impacts of climate change.



The Third National Climate Assessment (2014) summarizes the impacts of climate change on the United States, now and in the future. A team of more than 300 experts guided by a 60-member Federal Advisory Committee produced the report, which was extensively reviewed by the public and experts, including Federal agencies and a panel of the National Academy of Sciences.

The impact of climate change on ecosystems, biodiversity, and ecosystem services is detailed in this report.

Conservation – Context, Changes, and Challenges

Over the last century, the United States made enormous progress expanding resource stewardship efforts and building on our proud history of conservation. Today, we can celebrate 413 units in the National Park System, 562 national wildlife refuges, 174 national forests and grasslands, and collaborative conservation across more than 400 million acres of private working farms, forests, and ranchlands that make up our national conservation trust. Altogether, more than 31 percent of the United States is enriched by some form of conservation protections. This Administration has achieved and recognized more victories for wildlife conservation than any previous administration, and partnerships between government agencies and private landowners continue to make differences in both the stewardship of natural resources and the profitability of agricultural operations across millions of acres.

This progress – and rich legacy – is made possible in part by the robust protections kept in place through implementation of the Nation's bedrock environmental laws, unprecedented collaboration across industry, non-governmental and landowner partners, as well as critical public investments, including Federal investments through the Land and Water Conservation Fund (LWCF), National Park Service, Natural Resources Conservation Service (NRCS), and other important programs and organizations. That is why the Obama Administration has fought off efforts to undermine implementation of bedrock environmental laws through so-called "riders" on must-pass legislation, and has fought for increased Federal investment in conservation. For example, the Administration proposed full funding of $900 million in Fiscal Year 2017 for LWCF programs; called for an increase of $206 million in discretionary funds in Fiscal Year 2017 and $500 million a year for three years in mandatory funds to restore facilities and enhance visitor services at some of our greatest historical, cultural, and natural treasures; and strongly supports full funding for the NRCS' Environmental Quality Incentives Program – providing $1.65 billion – to help willing private landowners and agricultural producers implement conservation practices to address natural resource challenges such as soil erosion, air quality, water quality and quantity, and the sustainability of fish and wildlife habitat.

Vigorous implementation of our bedrock environmental laws, collaboration with diverse stakeholders, and sustained public investment are and must remain a central element of our Nation's conservation strategy.

Yet, in the face of increasing headwinds from powerful trends, such as climate change and the demands associated with population growth, our ability to sustain progress in conserving America's lands and waters depends on honing – and putting to use – new tools from the conservation toolbox.

Engaging Private and Philanthropic Capital

The Administration has taken historic action – across government – to boost the resiliency of our lands and waters. Federal financial resources have proven critical to those efforts, and the Administration prioritized substantial funding of conservation programs at the Departments of the Interior (DOI), Commerce, and Agriculture (USDA), as well as the Environmental Protection Agency (EPA) and others. The Administration also recognized, however, the significant potential of bringing private and philanthropic investments to complement traditional conservation funding and strategies.

Increased private sector investment can help close the deficit of conservation investment needed to maintain healthy ecosystems and the services that they provide. Leadership across all sectors and levels of government to unleash private capital for conservation are driving new resources to meet our growing conservation needs. However, significant capital, with investors ready and willing to invest remains frozen on the sidelines. Rapid progress in developing new conservation business opportunities has the potential to expand private investment to craft solutions that generate appropriate risk and return profiles for investors and demonstrate measurable conservation outcomes.

Three-Pronged Approach to Innovation

In order to bring more private and philanthropic investment off the sidelines to support conservation, we need to boost innovation in three areas:

- *First*, we need greater development of regulatory and incentive-driven **policy innovation** that facilitates investments in conservation, rewards outcomes and flexibility over rigidity, and creates predictability for investors;

- *Second*, we know these policy innovations will be more effective if paired with **finance innovation** – which means incubating novel combinations of private, philanthropic, and public capital that can scale new investment platforms tied to improved environmental performance; and

- *Third*, we need the **technology innovation** that can serve as a game-changer in ensuring private and philanthropic investment is effective in meeting positive conservation outcomes. In fact, we are already seeing technology advancements unlock low-cost capabilities for measurement, monitoring, and verification; enable better targeting of investments; and foster greater collaboration.

This document outlines some of the challenges and opportunities associated with expanding the role of conservation markets and impact investment in America's future conservation efforts - creating new value propositions for investors, entrepreneurs, landowners and natural resources managers.

SCOPING THE CHALLENGES AND OPPORTUNITIES

Background – Incentivizing Non-Public Investment in Public Goods

Many market-based solutions are built on the effective quantification and valuation of ecosystem services, and the establishment of outcome-based policies that create a demand for a measurable quantity or credit of environmental benefit. This type of policy can cap the total amount of a pollutant but still allowed (*e.g.*, ozone-

depleting chemicals), set a floor on the minimum level of consumption of something beneficial (*e.g.*, renewable energy), or require offsets for unavoidable impacts to important natural resources and the ecological functions and services they provide. In doing so, such policies seek to align public and private incentives to focus investments on high performing projects and engage private and philanthropic capital.

Conservation and environmental markets have been growing in importance in the United States since the 1980s. Perhaps the most well-known example is the cap-and-trade program for sulfur dioxide pollution from power plants – a key contributor to acid rain, as well as significant human health impacts. The program created a market cap for pollutant levels and allowed power plants to trade allowances, so long as the overall national cap was met. This "cap-and-trade" approach led to substantial environmental and public health improvements as it achieved a 40 percent decrease in sulfur dioxide pollution, while providing more flexibility for businesses to comply with the law, and ultimately resulted in annual cost savings of 15-90 percent compared to less flexible alternatives. Cap-and-trade programs like this one also have been used to reduce nitrogen oxide (NOx) pollution under the NOx Budget program, and more recently to reduce carbon pollution in the State of California.

Related conservation markets have developed, for instance under the national goal of no-net-loss of wetlands provisions in the Clean Water Act. These provisions have stimulated several billion dollars of private investment for wetland restoration through mitigation banks, which have enhanced and protected roughly 1 million acres of wetlands in exchange for the loss of a smaller area of wetlands associated with development. Similarly, markets in tradable development rights have been used to preserve open space near expanding urban areas.

Conservation markets and private investments are already having a multi-billion dollar beneficial impact on conservation. Pilot programs and other early efforts are under development in a number of conservation areas, including habitat restoration, water quality improvement, agricultural stewardship, endangered species protection, water supply protection and delivery and carbon sequestration. These emerging market opportunities offer additional revenue streams to complement current and maturing investment strategies in conservation-oriented real assets, like green wastewater infrastructure and sustainable agriculture and timberland investment.

Private and philanthropic investment also can be spurred when government agencies establish clear conservation outcomes for purchase, use procurement methods that are open to investors, or when real assets like timber, clean water or recognized stewardship in agricultural production have market value derived from private customers rather than government. The Obama Administration's successes in creating these sorts of "Pay-for-Success" initiatives, such as those to address prison recidivism, chronic homelessness, and early childhood education, have not yet been widely replicated in conservation by the public or private sector, but present an exciting opportunity for new innovation that can further drive investment opportunities in conservation.

Taking Stock – Projecting Future Investment

Currently, the contribution of conservation-focused impact investment is lower than the estimated potential market for this type of investment by two orders of magnitude.[i] We believe that increased innovation can help America tap this higher potential. The Obama Administration believes private and philanthropic impact investment in conservation within a decade can achieve $10 billion per year in support for conservation.

Analysts estimate that this type of investment was at approximately $230 million per year at the beginning of this Administration. A low estimate of current calendar year investment in the United States is approximately $1 billion – a four-fold increase.[ii] These estimates only reflect surveys of a subset of large private investors

working in the U.S. market in areas such as sustainable forestry, habitat restoration and protection, sustainable agriculture, and ecotourism.

As the conservation impact investment market grows, bond funding becomes a new opportunity as larger potential deals become available to offset high marketing and underwriting costs.[iii] Mitigation-related services, sustainable forestry and agriculture are the areas of investment expected to grow most rapidly. For example, the annual U.S. market for mitigation-related services today provided by private investors and businesses exceeds $200 million.[iv] Through innovations in policy, finance and technology, structured to incentivize private investment, it will be possible to expand the resources dedicated to protecting and restoring America's natural resources.

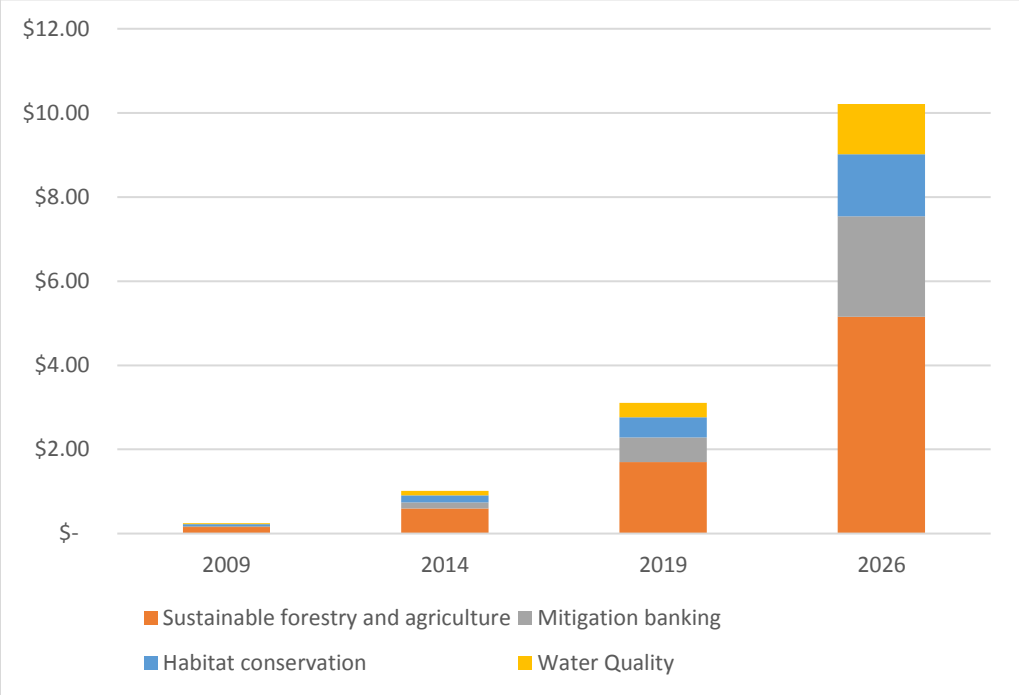


Figure 1. Estimated current growth in conservation impact investment between 2009 and 2026, including investments in sustainable forestry and agriculture, mitigation banking, habitat conservation and water quality improvements. Projected investment is based on the limited data on existing investment from earlier periods and is therefore likely to be a conservative estimate. Forestry (*e.g.*, Timber Investment Management Organizations), sustainable agriculture and mitigation banking are the sectors growing the most quickly, but water quality markets may have the greatest future potential for private capital to supplement local government investment.[v]

OUTLINING A THREE-PRONGED STRATEGY FOR INNOVATION

Overview

To meet the ambitious goal of mobilizing significantly more private and philanthropic capital in support of our Nation's conservation goals, key policy, financial and technological challenges must be overcome. The outline of that strategy is clear:

Policy Innovation

Increasing market investment in conservation depends in part on better aligning program requirements and incentives. Most existing conservation-focused policies are prescriptive of process and their enforcement may vary across agencies. However, policies can be designed to appropriately provide

greater confidence to the private sector, particularly by creating more certainty. The Administration is increasing transparency and consistency in the enforcement of conservation and environmental protection laws through cross-agency guidance issued by the natural resource trustee agencies. Policies can also allow public entities to procure conservation outcomes directly by defining the goals and performance objectives that markets or impact investments can deliver.

Finance Innovation

Many environmental services markets lack enough certainty or information to attract private investment, and as a result, financial risks can be greater than those of traditional investments. Public and philanthropic resources can, when appropriate, be used to leverage private capital by exploring the potential of new markets, creating the conditions necessary for market success, and lowering risk to investment. Modest public investments in the form of grants or low interest loans can be used to catalyze significant private capital investment in conservation. When coupled with policy actions, new tools such as credit enhancements, tax credits and others can help foster incentives for conservation investment and address investor concerns about risks in volatile, emerging markets. Overall investment risk can be reduced once these markets achieve greater scale and stronger investment track records, thereby reducing the cost of capital for future investments.

Technology Innovation

Until recently, it was not possible to collect and analyze data sets collected across large landscapes in response to conservation objectives. The high costs of collecting and analyzing this data have also limited the capacity to evaluate performance of environmental projects and strategically target investments. Recent advancements in monitoring technology and data analysis tools have improved reliability, reduced costs, and facilitated verification of whether or not projects are achieving their proposed outcomes. These technology advancements are providing transparency to all stakeholders and generating potential new value propositions across supply-chains. Considerable challenges remain, however, to integrate new hardware and software platforms, integrate data in decision making and continue the research and development of more advanced solutions.

Successfully developing opportunities for new investment will require collaboration between diverse stakeholders, including private investors, financial services firms, engineering firms, government regulators, and land and resource managers, academics, and conservation organizations. Balancing each organization's unique perspectives and goals can pose a challenge to efforts to achieve shared environmental objectives. For example, public agencies and private investors have dramatically different risk tolerances, approaches to evaluating risk, and time horizons. Additionally, some are skeptical of private actors making a profit through the financing of conservation projects. Transparent program design with a focus on measurable results of outcomes can address these challenges.

Building on Past Progress

The Obama Administration has been pushing for innovation across these three areas since day one, and a March 2016 White House announcement of $2 billion in new private sector commitments to conservation over 3 years shows that these actions are paying off.

Among related efforts the Administration has taken:

- Established a Presidential Memorandum and Department of the Interior Secretarial Order on mitigating the impact of development on natural resources and directed completion of a host of agency mitigation and investment policies that will be in place by the end of the Administration.

March 2016: $ 2 billion in new Private Sector Investments to Protect Natural Resources

Earlier this year, private sector leaders announced more than $2 billion in new private sector and non-Federal investments that they would make over the next 5 years to protect or restore the health of America's land, water and wildlife. This included $300 million from Ecosystem Investment Partners to protect and restore wetlands, streams and wildlife habitat; $850 million in mitigation projects to be implemented by the members of the National Mitigation Banking Association, Resource Environmental Solutions, and California High Speed Rail Authority; $150 million in conservation forestry and carbon sequestration projects by New Forests; and other commitments. Collectively, these commitments became one of the biggest non-Federal investments in conservation ever announced.

- Initiated different approaches to natural resource conservation through the Department of Agriculture's Regional Conservation Partnership Program (RCPP) by empowering local communities to work with multiple partners, farmers and ranchers to design and invest in regional solutions that work best for them. A federal investment of $1.2 billion in RCPP over the next five years will leverage an additional $1.2 billion from partners for innovative conservation work.

- Undertook the largest cooperative landscape-level conservation planning effort in history – with Federal agencies, states, local governments, and private ranchers – to conserve 70 million acres of the western sagebrush ecosystem, conserve the Greater Sage Grouse and protect more than 350 other wildlife species.

- Incentivized greater water conservation through WaterSMART funds provided by the Department of the Interior from 2010 – 2015. This work combined with other conservation programs is anticipated to result in more than 977,000 acre-feet savings of water annually once all conservation and efficiency improvements have been completed.

Approaches to Boost Policy Innovation

Smart policies can create incentives that spur private and philanthropic capital investments into conservation and generate demand for ecosystem services. Examples of policy innovation include expanding new and existing markets by considering private sector risk, designing programs that have flexibility in how conservation outcomes are achieved and delivered, and increasing consistency and transparency of government programs. The Obama Administration is crafting new policies to address these opportunities -- demanding more for taxpayer investment, leveraging flexibility to create market pull, and creating new opportunities for valuing ecosystem services.

Demanding More for Taxpayer Investment

Even though performance-based service contracting has been available to Federal agencies for decades, almost all Federal grants and contracts for environmental projects are task-based. Pay for Success (PFS) is an alternative approach that pays for measured outcomes. Under these PFS systems, the Federal government defines the specific outcomes to be achieved and the contractor or grantee receives compensation only when those metrics are met. PFS structure can have a range of benefits, as it focuses procurement on intended results, allowing the government to define success upfront, and incorporates rigorous evaluation directly into the contract, with payment contingent upon pre-determined success metrics being met. Such programs can reduce administrative overhead and allow contractors and grantees flexibility in proposing innovative solutions.

These strategies also ensure that resources are spent efficiently and effectively – shifting project risk from the taxpayer to the private sector, as the Federal government does not pay for services if outcomes are not met, ensuring that public resources are spent efficiently and effectively. Although not a contract or grant-based program, wetlands banking under the Clean Water Act incorporates important elements of a PFS program such as performance-based credit release, and there has been greater than a 50 percent increase in the number of such banks established since 2008. Although use of PFS remains limited for conservation, the Obama Administration has supported its scale up through innovative new policy.

Leveraging Regulatory Flexibility

Updated natural resource policies that set clear targets in regulation, while expressly providing flexibility in how targets are achieved, can help enable markets to be an effective force for conservation. Flexibility allows businesses and investors to seek out the most efficient ways to achieve policy targets. Wetland and stream mitigation banking provide some of the best examples in the U.S. where conservation marketplaces have developed to allow regulated interests to purchase offsets. Mitigation, which is defined as avoiding and minimizing damages to natural resources, and then compensating for unavoidable damages, can achieve strong environmental outcomes while encouraging development and providing services to the American people. Building upon President Obama's November 2015 Presidential Memorandum that called for economic development, infrastructure, and national security goals to be aligned with environmental preservation, the Department of the Interior's Fish and Wildlife Service (FWS) released a draft compensatory mitigation policy to help address the impacts of development on the nation's most at-risk species. The policy is the first comprehensive treatment of compensatory mitigation under authority of the Endangered Species Act (ESA) to be issued by the FWS.

The policy covers all compensatory mitigation mechanisms for all species and habitat protected under the ESA and for which the FWS has jurisdiction. It sets forth clear standards that apply to all compensatory mitigation mechanisms that may be proposed by federal agencies or applicants to offset impacts to species listed under the ESA and/or designated critical habitat, as well as mitigation proposals by mitigation sponsors for conservation banks, in-lieu fee programs and other third party mitigation arrangements. The draft policy modernizes rules for the use of innovative tools and financing to help further protect endangered or threatened species and their habitats while allowing economic activity to continue.

In another example, the Department of Agriculture supported an alternative compliance solution under the Clean Water Act pioneered in Oregon, where, in an effort to lower temperature pollution from a wastewater treatment plant that was impacting salmon habitat, a group of organizations created a program to achieve 600 million units of temperature reduction credit for public purchase through planting riparian corridors. The solution saved a local community nearly two-thirds the cost of its next best alternative—installing a large cooling tower—while benefiting local producers and ecosystems with rental payments and improved habitat.

Valuing Ecosystem Services

A 2016 USGS report found that for every dollar invested in ecosystem restoration, $2.20 - $3.40 flows through the U.S. economy. Ecosystem services contribute to jobs, economic growth, health, and well-being by producing an array of benefits that people depend on, including fisheries, drinking water, fertile soils for growing crops, climate regulation, and cultural values. Achieving an increase in private, for-profit funding for conservation depends on enabling private markets to value these services.

The Administration has encouraged markets to play a role in achieving natural resource conservation. The USDA Office of Environmental Markets (OEM) was established under the 2008 Farm Bill to develop uniform guidelines for quantifying environmental benefits from voluntary conservation and land management activities. Additionally, the Environmental Protection Agency and the Department of Agriculture supported the Commonwealth of Virginia's 2014 launch of a nutrient trading market to achieve water quality needs for the Chesapeake Bay. Virginia's program now functions in almost every region of the state, allowing farmers to produce and sell credits to offset runoff from construction projects, highways, and roads. In 2015, the Office of Management and Budget, Council on Environmental Quality, and Office of Science and Technology Policy jointly issued a memorandum providing direction to agencies to incorporate ecosystem services into Federal planning and decision making.

Approaches to Boost Finance Innovation

Efforts to scale up private investment and emerging conservation markets would benefit from the lessons learned in the development of the renewable energy sector. In 2009, investors provided $24 billion for new renewable energy projects. By 2015, this had increased by 83 percent, to $44 billion. Part of this increase was fueled by the development or application of financial tools. These tools included grants to explore new markets and to create the conditions necessary for them to flourish, direct grants and tax credits to subsidize equity returns, direct loans, loan guarantees, price guarantees and subsidized insurance. The Administration has taken initial steps to use, when appropriate, some of these tools in emerging conservation markets. Many of these efforts - developing best practices, sharing data, and creating new partnerships; piloting new business models; and scaling new markets – offer a platform for bolstering private investment in conservation and restoration of our natural resources.

Developing Best Practices, Sharing Data, and Creating New Partnerships

Functioning markets have significant infrastructure that is oftentimes taken for granted, including a common nomenclature, participants with the necessary technical proficiencies, baseline data, and organizational networks. Under the Administration's Build America Investment Initiative, the Environmental Protection Agency and the Departments of the Interior and Agriculture have recruited financial experts and created their own Build America finance centers. These Centers are working to identify and harness existing public assets to build some of the necessary infrastructure for private investment. The Centers are helping agencies make investment opportunities more attractive to investors and represents an explicit signal to the private sector that Federal agencies are trying to understand and work them. The Centers are also working with non-Federal stakeholders to develop new opportunities for public-private collaboration and are providing a valuable portal into Federal agencies to encourage communication and engagement with the private sector.

Piloting New Business Models

Federal grants can play an important role in providing the capital necessary to develop inaugural market transactions, such as funding feasibility analyses, to determine if the necessary enabling conditions are in place. For example, the Department of Agriculture's Renewable Energy for America Program awards grants to farmers, ranchers, and rural small businesses for studies that determine the efficacy of potential renewable energy projects. Similarly, the Biomass Research and Development Initiative, administered jointly by the Departments of Agriculture and Energy, provides grants for research and demonstration projects that produce sustainable biofuels and other bio-based products.

If conditions required to spur private investment are not present, grants can also be used to create those conditions through technical assistance, training, and data analysis. For instance, the Department of Energy's SunShot Initiative provides grants to create sustainable solar market conditions by standardizing technologies, increasing data accessibility and quality, and providing networking opportunities across the industry. An example of applying similar tools for conservation includes the Department of Agriculture's Conservation Innovation Grants (CIG) program, which recently funded eight projects that are developing new conservation finance approaches or are piloting innovative financial vehicles. The 2016 CIG awards with additional conservation finance projects are scheduled to be announced in early September.

Scaling New Markets

Where business models are established, scaling up can be a significant challenge in nascent markets. At the initial stages, grants can be used to directly fund projects and tax credits can be used to lower project costs and raise investors' return on equity. For instance, Section 1603 of the American Recovery and Reinvestment Act provided $25 billion in federal grant funding for the construction and installation of renewable energy facilities, which led to an additional $65 billion in state, regional, and private financing for more than 100,000 projects. Similarly, for conservation, the Treasury Department has allowed the use of New Markets Tax Credits to subsidize investments in sustainable forestry projects. Approaches like this can promote additional private investment in conservation.

Low-cost debt financing is another tool that, in certain instances, can be used to scale up new markets as early transactions will be perceived to be high-risk and thus demand returns that project cash flows cannot service. Direct loans and loan guarantees have been used to address this challenge in the renewable energy markets. The Environmental Protection Agency will publish a new playbook for financing non-traditional wastewater projects, like green infrastructure, water conservation, energy efficiency and nonpoint source protection. The playbook will describe examples of innovative financing currently utilized in some states and will highlight various financing options, such as State Revolving Fund assistance, fee programs, issuance of green bonds, watershed financing, interstate assistance, "Pay For Success" programs, and innovative partnerships.

Approaches to Boost Technology Innovations

Technology tools have enormous potential to change conservation markets and impact investment. Already, new technologies are revolutionizing our ability to observe, understand and conserve the diversity of life on this planet. To maximize the utility of these new technologies, we must improve our ability to integrate observations derived from many different platforms at a wide range of spatial scales. Doing so requires networks of outputs from satellite and aircraft (including low-flying unmanned aerial vehicles) instruments, camera traps, acoustic sensors, and environmental DNA, bringing together disparate datasets in a common geographic reference frame for comparison. Several of these approaches lend themselves well to crowdsourcing and citizen science, thereby increasing the number of observations to fill large gaps remaining in *in situ* biological data.

Despite the tremendous potential and clear interest in linking conservation to market transactions, the data to monitor and evaluate natural resources remains undersubscribed, in part because the market for environmental information is new, the supply of environmental data has been limited, and the capabilities to analyze this data for purposes of decision making have been limited. Creative solutions to resolve outstanding issues related to data propriety and confidentiality and the integration of new systems and datasets will also be needed. However, due to the dramatic reduction in cost of both the collection and the processing of landscape-level, environmental data has the potential for transformative impacts.

Lowering the Cost of Data Collection and Increasing Data Availability

The cost of environmental sensors has dropped dramatically in recent years. Additionally, new approaches to making satellite measurements, such as through small satellites or small satellite constellations, have the potential to augment imagery from tried-and-true satellites like Landsat and the Moderate Resolution Imaging Spectroradiometer (MODIS) on current National Aeronautics and Space Administration (NASA) satellites, which support forest, water, and fire monitoring – among many other environmental metrics. The lower cost of development compared to more traditional satellite platforms allows for iteration and development at rates much higher than even ten years ago. Development of small satellites also presents lower barriers to entry for small businesses and universities and greater use of off-the-shelf components, which may further reduce costs. In addition to advances in remote sensing, in situ monitoring has become cheaper, riding on the successes seen in the Internet of Things and Maker movements. For example, several federal agencies jointly launched a nutrient sensor challenge in December 2014 to accelerate the development of cost-effective water quality sensors that can measure nutrients in aquatic environments and transmit data in real-time. Since excessive nutrient loading is the leading cause of impairment of U.S. waters, reliable sensors are critical to outcomes-based water quality improvement projects.

However, open data alone is not sufficient to spur a market for innovation. The data must also be accessible to application developers that convert data into actionable insights. The Federal government has started to build the digital infrastructure required to support meaningful use of public data generally, and especially environmental data, for example:

- The National Oceanic and Atmospheric Administration (NOAA) Big Data Project was designed alongside private cloud providers to increase the usage of NOAA data. This project, alongside similar projects at NASA to surface earth observations, has dramatically increased the accessibility of the data to monitor natural resources, climate, and weather.

- The Army Corps of Engineers' Regulatory In-lieu-fee and Bank Information Tracking System (RIBITS) developed in partnership with Environmental Protection Agency, Fish and Wildlife Service, NOAA, and Federal Highway Administration is a web-based tool that tracks conservation offsets generated from third-party wetland, stream and species habitat restoration and protection projects. With publicly accessible information including credit and debit ledgers for each offset site, RIBITS promotes better tracking and transparency in these credit markets, supporting the needs of regulators, credit providers, and customers.

- USDA and Colorado State have developed a web-based software tool known as COMET-Farm, which can be used by agricultural producers, conservation planners and interested stakeholders to develop a greenhouse gas inventory for an agricultural operation. Running different scenarios allow producers to understand how changes in land management can impact the greenhouse gas footprint of the operation. Tools for other environmental resources are in development.

Improving Data Processing and Building Strategic Partnerships

Planning, implementing, and monitoring conservation projects requires data to target actions and measure success. However, the value of environmental data is not realized unless they are processed into actionable insights to make data transparent and understandable to inform decisions. The ability to integrate across diverse datasets and communicate data clearly to the public is enabling new capabilities, such as allowing land managers to develop new strategies for minimizing conflict and balancing development activities and conservation.

The accessibility of cloud computing has created new opportunities for a broad set of researchers to test and innovate on new machine-learning algorithms for both prediction and assessment. For instance, The Chesapeake Conservancy, in cooperation with the Environmental Protection Agency and Department of the Interior, is producing high resolution land-cover datasets that can improve the efficiency and effectiveness by improving the targeting of conservation efforts. The Conservancy has also partnered with Microsoft and ESRI to develop an automated, cloud-based platform to increase the speed and reduce the cost of production the land cover data. Even quantum computing has been featured; researchers at NASA Ames Research Center have used a quantum computer to count each tree in California, using computer vision algorithms adapted to this exciting new computation *architecture* – for the purposes of environmental monitoring. However, integrating across diverse datasets at a massive, landscape-scale is not easy and challenges continue to exist. To advance this integration, the Obama Administration is bringing together the community of users and developers involved in this work to break down barriers and scale up adoption.

CONCLUSION

The impacts of climate change, such as increasingly severe wildfires, droughts, and extreme storms are not only harming communities across the country, they are also having devastating effects on America's natural resources. These impacts increase the challenges faced by our Nation's conservation agenda. Private and philanthropic investment represents one important tool in the conservation toolbox – one we must hone and put to use if we are to succeed in the face of these challenges.

By increasing innovation across three areas – policy, finance, and technology – we can bring more private and philanthropic capital off the sidelines and into the game. Despite the complexities, the Obama Administration continues to make a concerted and comprehensive push to unlock these resources and encourage would-be partners. The complexity of attracting private and philanthropic capital to secure a public good is one we must acknowledge. Innovation across policy, finance, and technology can marshal greater progress toward conservation goals and encourage private capital to join the effort to conserve and restore America's natural resources.

[i] See https://www.credit-suisse.com/media/assets/corporate/docs/about-us/responsibility/banking/conservation-finance-en.pdf
[ii] See https://www.jpmorganchase.com/corporate/Corporate-Responsibility/document/InvestingInConservation_Report_r2.pdf
[iii] See https://www.credit-suisse.com/media/assets/corporate/docs/about-us/responsibility/banking/conservation-finance-en.pdf
[iv] See http://www.eli.org/sites/default/files/eli-pubs/d17_16.pdf and https://www.cbd.int/financial/privatesector/g-private-wwf.pdf

[v] The conclusion that it is possible for conservation impact investment to grow to $10 billion in ten years, is based on survey information from major investors described in https://www.credit-suisse.com/media/assets/corporate/docs/about-us/responsibility/banking/conservation-finance-en.pdf and https://www.jpmorganchase.com/corporate/Corporate-Responsibility/document/InvestingInConservation_Report_r2.pdf., which represent only a subset of the investment occurring. The estimate is based on the 82% of these investments that are reported from the United States, and the rates of growth in past and projected investment, from annual data between the period between 2004-2008 and five year periods between 2009-2013 and 2014-2018. We assumed similar growth would continue during the period between 2019-2026. The breakdown between habitat, sustainable forestry and agriculture, and water quality investments is also included in these reports and we assumed would continue in a similar pattern of growth. Additional data was provided on mitigation banking investments by the National Association of Mitigation Bankers and included in the March 07, 2016, White House Fact Sheet on $2 billion in new private sector investments found here: https://www.whitehouse.gov/the-press-office/2016/03/07/fact-sheet-2-billion-new-private-sector-investments-protect-natural The future growth of investments in mitigation banking were extrapolated to 2026, based on the above referenced reports.