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Private Lands Review

Broadening Conservation Funding

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ABSTRACT Funding for natural resource conservation has been largely static or declining over the past 30 years. Environmental challenges are increasing in number and intensity, requiring improvements in efficiency of conservation delivery and broadening of the base of financial support to address these challenges. The conservation community would benefit from de-siloing environmental foci and movement to more of a systems approach to intensify conservation. There are new partnerships and opportunities to increase the base and variety of sources of funding. To protect and possibly enhance funding for conservation, key innovations in finance and establishing additional funding sources are required. © 2019 The Wildlife Society.

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There are a myriad of federal funding programs for conservation, but they are inadequate to meet 21st Century needs. We will not try to catalogue all the sources, but rather highlight the major sources and trends that focus on wildlife and habitats. Specifically, we focus on funds made available by federal institutions to assist conservation, separate from the large amount of funding retained by federal agencies to spend on regulatory actions, operations, agency lands, research, enforcement, and other actions. Most significantly, we suggest how to produce more with existing funds and potential strategies to increase and broaden conservation funding.

With the increase in human population; occupation of the landscape by anthropomorphic activities; and a projected massive increase in food, fiber, and fuel needs, we must provide a massive intensification in delivering conservation. Ultimately, the conservation community needs to develop additional, creative funding sources. Relying almost solely on government funding will not be sufficient to meet the conservation needs. Government funding is static to declining while the need is increasing. There are no projections that indicate government funding sources will be significantly increased. Evolving programs and funding sources have had some effect on conservation, but no major innovations for funding conservation have occurred in the past 30 years. We need to step up delivery, have clear metrics that effectively communicate conservation outcomes delivered, and increase and critically diversify funding sources.

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BRIEF HISTORY OF FEDERAL CONSERVATION FUNDING PROGRAMS

The portion of the federal budget that includes all environmental and natural resource funding is termed Function 300. The Congressional Research Service identifies the Natural Resources and Environment function as covering: "Water resources (301); Conservation and land management (302); Recreational resources (303); Pollution control and abatement (304); Other natural resources (306)" (www.everycrsreport.com/reports/98-280.html, accessed 19 Jul 2019). As recently as the Reagan Administration, specifically 1982, the portion of the federal budget that went to these programs was almost 4%. Today, the amount of funding in Function 300 is less than 1% (US$35 billion), with only 0.4% being spent on programs important to hunters, anglers, and other outdoor-related enthusiasts (Hansen 2013).

Pittman–Robertson

Congress passed the Federal Aid in Wildlife Restoration Act in 1937 (16 U.S.C. 669-669i; 50 Stat. 917) as one of the first federal efforts to fund conservation at the state level (https://uscode.house.gov/view.xhtml?path = /prelim@title16/chapter5B&edition = prelim, accessed 19 Jul 2019). Commonly known by the legislation's sponsors' names, the Pittman–Robertson Act (PR) is widely regarded as one of the most important funding mechanisms for wildlife conservation. Rather than draw from the Treasury, the PR Act is funded through an excise tax on sporting arms and ammunition. It was enacted with the strong support of the Sporting Arms and Ammunition Manufacturing Institute and the wildlife community.

The Act has been reauthorized and amended to broaden the reach of the excise tax (e.g., the Act was amended in the

1970s to include handguns and archery equipment) and increase the tax rate. This "user fee" has been widely supported by the sportsmen's community and has delivered >US$11.5 billion (https://uscode.house.gov/statviewer.htm?volume=133&page=866, accessed 19 Jul 2019) for wildlife conservation (Congressional Sportsmen's Foundation; http://congressionalsportsmen.org/uploads/page/PR_HR_877_One_Pager_2019.pdf, accessed 19 Jul 2019). Of particular note of the PR Fund, unlike most other federal conservation spending programs, it is not subject to annual appropriations from Congress. Instead, the funding is drawn directly from the U.S. Department of the Treasury.

Partners for Fish and Wildlife

The "Partners" program is the U.S. Fish and Wildlife Service's lead funding mechanism for working with private landowners. Although small in scope, the Partners Program is designed to provide private landowners with technical support and financial assistance to restore and enhance fish and wildlife habitat, especially for federal trust species (e.g., migratory birds, threatened and endangered species). The Partners program explicitly recognizes that the vast majority of fish and wildlife species, especially at-risk species, are dependent on habitat associated with private lands. It is immensely popular with private landowners in part because of the low administrative burden and ease of applying. However, funding for this popular program has declined from a peak of US$60 million in 2010 to flat funding of US$51.5 million over the past 5 years. In short, real dollars are declining while the need is increasing.

Land and Water Conservation Fund

First authorized by Congress in 1964, the Land and Water Conservation Fund (LWCF) arose out of a broad recognition—sparked by an Eisenhower Administration commission and a legislative proposal from President John F. Kennedy—that the inventory of conservation lands in the United States needed to grow to meet an ever-increasing demand for public outdoor access and natural resource protection. As originally crafted, LWCF was largely directed toward securing recreation lands, with a focus on 1) land purchases to augment the National Park, National Forest, and National Wildlife Refuge systems, and 2) establishment and enhancement of state and local parks.

During the past half-century, Congress has updated the LWCF and expanded these authorized purposes to adapt its uses and funding to the changing face of conservation in North America. The allocation of LWCF funds is established within the Act with not less than 40% going to federal agencies and the remaining 60% allocated to the states (54 U.S.C. § 200305(b)). The principle purpose of the Fund is to support recreation. There can be allocation to private lands partnerships at the discretion of the managing agencies. The vast bulk of the fund has gone for land acquisition and outdoor recreation infrastructure. Limited funds are available to support management of federal trust species or on a limited basis for specially designated purposes (Vincent 2019). Congress added a broad suite of state and local land-conservation grant programs under the LWCF umbrella to supplement state park grants in response to a variety of community and resource needs that complement the federal conservation areas and state parks the fund initially addressed. These include the following:

i. The Forest Legacy Program, which maintains working landscapes, prevents forest conversion, and protects forest habitats and ecosystems through fee and easement purchases;
ii. Land conservation to advance recovery and habitat conservation plans for federally listed species through the Cooperative Endangered Species Conservation Fund;
iii. The American Battlefield Protection Program, which conserves key lands where wars were waged on American soil;
iv. The Highlands Conservation Act, which protects watersheds, water supply, forests, and associated resources in the Highlands region of 4 northeastern states (CT, NJ, NY, and PA, USA); and
v. Outdoor Recreation Legacy Partnership grants, funded within the original state park grants' program, to address specific parkland and natural resource needs in urban areas.

Initially, the LWCF was authorized to be funded at US$60 million/year. By 1968, it was clear that funding demand far outpaced the program's original funding stream. Congress enacted the first of several increases in LWCF, which soon authorized funding up to US$900 million/year. To pay for these increases, Congress dedicated a portion of annual receipts from offshore oil and gas activity in federal waters on the Outer Continental Shelf to the fund. The logic here was simple and elegant: as our nation sells off one limited asset that belongs to us all, we reinvest some of the proceeds into assets with enduring value for all. Over the life of the fund, US$40.9 billion has been deposited into the LWCF account.

Unlike mandatory spending in the Federal Aid in Wildlife Restoration program, funds available through the LWCF are not automatically available for conservation. Instead, funding is subject to the annual Congressional appropriations process that sets spending levels for federal conservation and grant programs. Although dedicated US$900 million in revenues authorized under the LWCF are predictably deposited into the fund, spending varies from year to year (Fig. 1). Since 1965, Congress has appropriated US$18.8 billion for funding LWCF-related purposes, but has effectively left an "IOU" in the LWCF account while "offsetting" other spending with LWCF revenues. The unobligated paper balance in the LWCF has masked the size of the annual deficit for unrelated spending, rather than going to its legislatively intended conservation uses (Fig. 1).

The future of annual deposits into the LWCF was assured with the inclusion of permanent reauthorization of the LWCF in the John D. Dingell, Jr. Conservation, Management, and Recreation Act of 2019 (P.L. 116-9). Nothing in this legislation, though, prevents the continued siphoning of unappropriated funds each year for non-conservation uses. Congress has previously considered proposals to end the diversions of the LWCF's revenues and

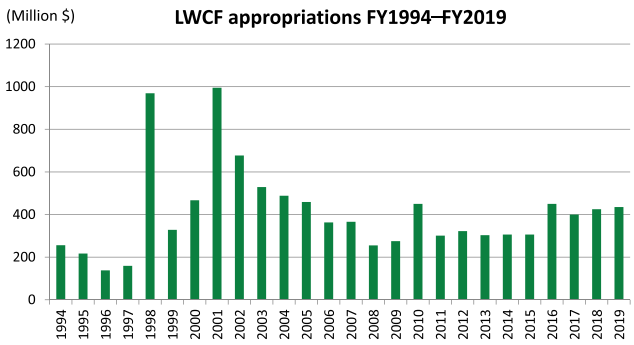

Figure 1. Land and Water Conservation Fund (LWCF) appropriations for fiscal year (FY) 1994 through 2019, United States. (Adapted from Congressional Research Service 2019:Fig. 4).

ensure these funds are fully spent each year exclusively for the LWCF programs, and such legislation has again been recently introduced.

Farm Bill—The 800 Pound Gorilla

With the enactment of the Food Security Act in 1985, Congress passed a revolutionary way to fund conservation with the adoption of the first Conservation Title to a Farm Bill. This provision made several key changes in conservation:

i. It created the first title ever dedicated to conservation in a Farm Bill. Previously there had been sections dedicated to constraining overproduction, soil conservation, and watershed protection, but there never had been such a comprehensive approach to delivering conservation.
ii. It created several program initiatives to terminate federal subsidies that caused environmental degradation and started to advance a significant investment in conservation. Those programs included: Sodbuster to terminate federal subsidies to break out new lands for the production of commodity crops; Swampbuster to terminate federal subsidies to drain wetlands to produce commodity crops; Conservation Compliance, which required conservation measures to participate in federal farm programs; and the Conservation Reserve Program (CRP) to retire the most highly erosive lands and farmed wetlands from production.
iii. It created a significant savings to taxpayers while advancing conservation by terminating subsidies that degraded the environment and reduced the need for expenditures on purchasing, storing, and processing surplus commodity crops.

Taxpayers saved billions of dollars, conservation was advanced, farmers benefited from increased commodity prices, and the largest conservation funding program in our nation's history began.

This new Conservation Title was rapidly hailed by the wildlife community as landmark legislation in providing environmental protection and increasing habitat for the nation's fish and wildlife (Heard et al. 2000). Prior to adoption, North American waterfowl populations were at an all-time low. Ring-necked pheasant (*Phasianus colchicus*) populations were severely depressed. Recognizing that the vast majority of wildlife habitat is on private lands, this title program created a major source to fund creation, restoration, and enhancement of wildlife habitat on private working lands. The Farm Bill is one of the largest single sources of conservation spending in the federal budget. It represents the single largest federal investment in private-lands conservation. Landscape changes as a result of the Farm Bill cannot claim all the credit for turning the tide on recovery of many species, but it is widely regarded as the pivotal action to upgrade investment in wildlife and conservation delivery, especially involving population increases of wetland-associated species of birds. North American waterfowl populations hit an all-time low of approximately 25 million in the mid- to late 1980s. Since then their population has risen to almost 50 million in 2010 and >40 million today. (U.S. Fish and Wildlife Service 2018). Since the adoption of the first Conservation Title in 1985, there have been numerous updates to the law, including the following:

i. In 1990, the Food, Agriculture, Conservation, and Trade Act added the Wetlands Reserve Program and the Forest Legacy Program to the suite of programs.
ii. In the 1996 Freedom to Farm Act, there was a proliferation of additional conservation programs, increasingly dedicated to specific subsets of conservation objectives and constituencies. This trend continued through the next 2 Farm Bill cycles. One of these programs was the Wildlife Habitat Incentives Program. (This specific program and several others have been consolidated into larger simpler administrative structures over the past 2 Farm Bills. The authority has been retained but the separate program distinction has been removed.)
iii. The Farm Security and Rural Investment Act 2002, which created the Grassland Reserve Program.
iv. By 2014, the Natural Resources Conservation Service (NRCS) was administering >20 different conservation programs. Some of the most notable include the Conservation Stewardship Program, the Environmental Quality Incentives Program, the Farmland Protection Program, and Wildlife Habitat Incentives Program; and

others much more limited in their breadth. The Agricultural Act of 2014 consolidated many of these programs.

Since its inception in 1985, there was growth in funding to support on-the-ground conservation. The Conservation Title had grown to provide approximately US$5 billion/year. Unlike most other government-administered environmental-funding programs that retained the financial resources within the federal agencies, Farm Bill funding is designed to principally put conservation dollars into private hands for on-the-ground protection, restoration, and enhancement of private lands. These funds are delivered into conservation implementation largely through financial assistance programs to implement specific conservation management practices (U.S. Department of Agriculture - Natural Resources Conservation Service; see https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/?&cid = stelprdb1048817) through direct relationship with agricultural producers and increasingly through partnerships with nongovernmental organizations and other conservation communities.

Natural Resources Conservation Service conservation funding programs are oversubscribed. Qualifying requests for NRCS conservation funding exceed US$15.89 billion (NRCS, unpublished data) compared with a budget of US $4.37 billion in 2018). Demand for enrollment in the second-largest category of Farm Bill funding, the CRP, greatly exceeds spending authority. The CRP acreage is capped by statute and funded through the Commodity Credit Corporation, making it an "off budget" program. The current cap is 20 million acres, with demand estimated at approximately 40 million acres.

During periods of low commodity prices, like we are in now and are predicting for the foreseeable future, interest in enrollment in the CRP increases. With low commodity prices, producers look to stabilize income through other means, including enrolling more land in conservation programs that have an annual payment. The average corn price in the United States in 2018 of US$3.60/bushel was less than half the per-bushel price of US$6.89 at its peak in 2012 (National Corn Producers Association 2018). Low commodity prices drive increased demand for enrollment in annual payment programs like the CRP.

Funding available for conservation within NRCS peaked in 2010 and has generally been flat to declining since. These trends have continued through Administrations of both political parties. It has generally declined since then through a series of actions, including the Changes in Mandatory Programs, which allowed an across-the-board cut in mandatory spending programs. Some Farm Bill programs are funded through the Commodity Credit Corporation. This change was made to protect programs from annual variations and program limitations in discretionary programs (Fig. 2).

In a time of increased pressure on federal spending, there are major barriers to significantly improving funding for Farm Bill conservation programs. In the face of static funding, more and more special interests are looking to draw support from these funds. In the 2018 Farm Bill, a provision was added to require 10% of funding to go to source water protection (Agriculture Improvement Act 2018 [P.L. 115-334; U.S. Congress 2017–2018]; Association of State Drinking Water Administrators, www.asdwa.org/2018/12/21/2018-farm-bill-includes-new-drinking-water-provisions-in-conservation-title, accessed 19 Jul 2019). This action authorizes the potential for money to be diverted from the principle purposes the Conservation Title was created to support. However, it could also bring in substantial and important new constituencies of water users to support the basis of funding for conservation in the agricultural landscape. It is too early to tell if this broadening of the authority will diminish the effectiveness of the program or build important new partnerships and broaden the political support.

EMERGING AND GROWING CHALLENGES

At the same time that funding is constrained, demands to deliver conservation are increasing. Farmlands in the United States are being lost at an alarming rate. Just between 1992 and 2012, almost 31 million acres of agricultural lands were

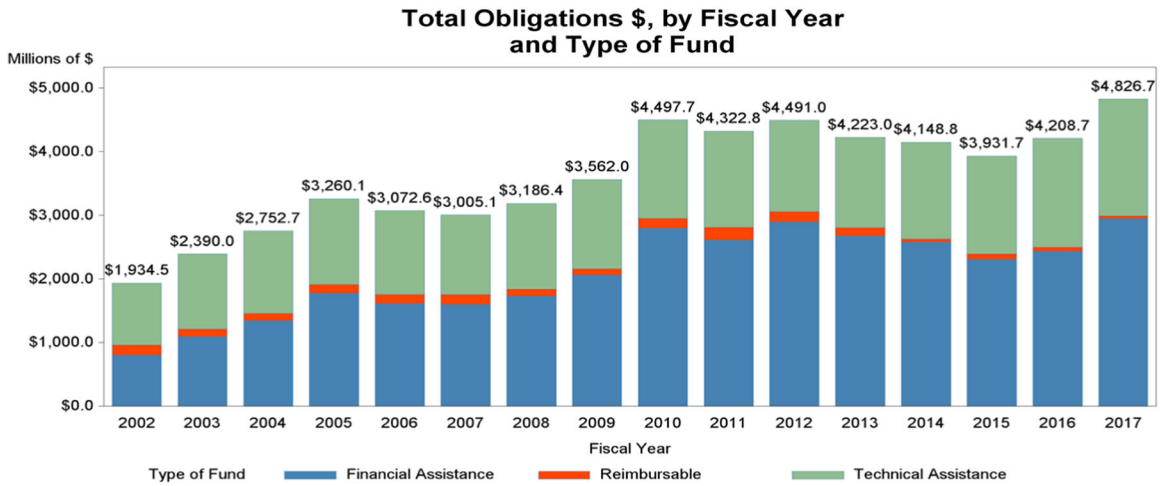

Figure 2. Total obligations of the Land and Water Conservation Fund, by fiscal year and type of fund, USA.

converted to more intensive use (Sorensen et al. 2018). World demand is significantly increasing for food production, which will put even more strain on U.S. farmland and other important conservation resources. The growth in population, projected to reach between 9 and 10 billion people by midcentury, is well-known and effects well-understood (Fig. 3). What is not so well-recognized, and likely will have a much greater ecological effect, is that as wealth in the developing world increases, food demands will shift to a more protein-centric diet. That means that billions of people will shift away from a predominately cereal-based diet to one with much larger protein allocation. More grain and forage will need to be produced to feed animals as animal protein plays a larger part in global food diets. We will simply have to do more with less if we are to meet these demands while managing the environment even at a steady state (Figs. 3, 4).

The capacity to meet the increasing food demand will largely fall on U.S. farmers because much of the arable land in other nations has been purchased by foreign owners from rapidly growing nations in anticipation of future food-production capacity constraints. We have the soil and water resources, and technology to meet food production requirements. Much of the rest of the world faces severe constraints on those 2 critical resource elements (Food and Agriculture Organization of the United Nations 2011). Water in particular will likely become an increasingly critical resource for food production, putting pressure on fish and wildlife needs (Rosegrant et al. 2019).

We Need to Get More for Our Money

Demand for implementing conservation exceeds available funds. Virtually every program investing in conservation is oversubscribed (Authors, NRCS, personal communication). This oversubscription threat creates an opportunity to change policies on how funds are allocated. Deploying market tools that seek a greater environmental return on investment can be an important innovation for a more effective use of limited funds. With static funding, and increasing pressures on environmental resources, we need to develop additional strategies to meet 21st Century challenges. As we confront increasing demand for conservation delivery, a shrinking natural resource base and uncertain funding, it is clear we must innovate.

First, we have done a poor job of documenting conservation benefits that have been delivered through spending programs. Commonly, we have measured success with poor surrogates, such as dollars allocated, acres enrolled, or miles 'protected.' These metrics do not speak to the actual conservation objectives measured as ecological services, including improvements in water quality, wildlife populations, soil productivity, or biodiversity. We need to do a much better job of assessing conservation effects and telling the story of how limited financial and human resources are used to deliver conservation outcomes.

When many of the major conservation programs were established, we did not have the knowledge or capacity to measure (much less project) conservation outcomes. Without that ability to define environmental outcomes,

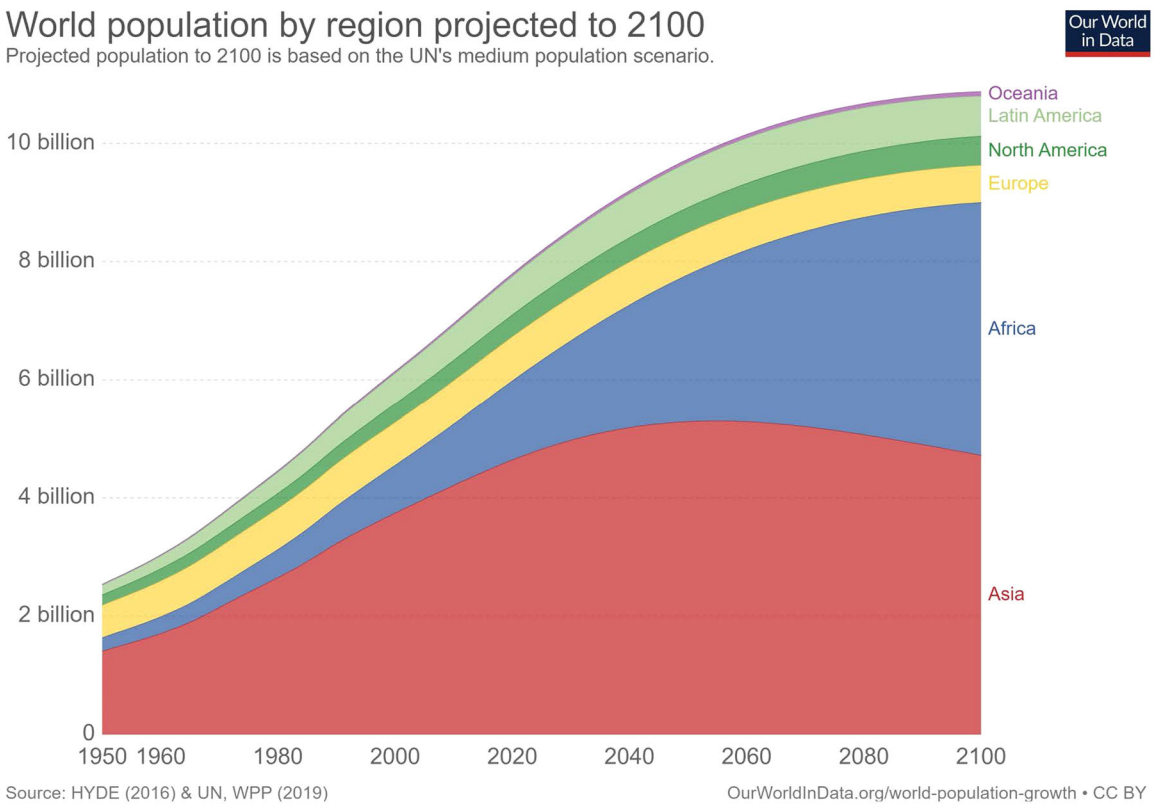

Figure 3. World population 1965–2050. (Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat [2017], https://population.un.org/wpp/, accessed 23 Jul 2019).

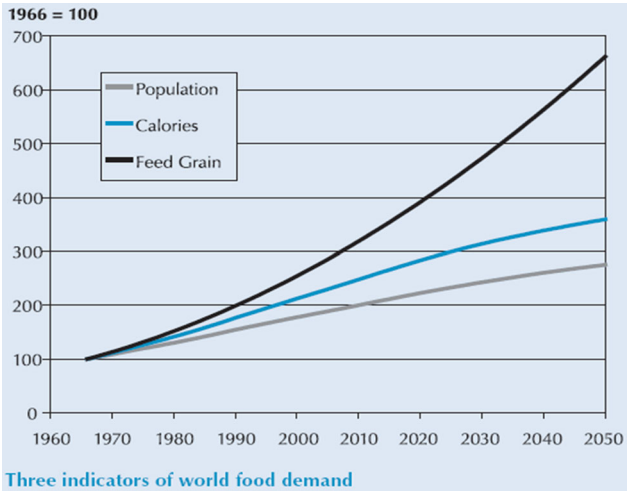

Figure 4. Factors contributing to increased global food demand. (Source: B. A. Babcock, Iowa State University, personal communication).

secondary metrics were acceptable. Today, however, we know enough to much more accurately measure and even predict conservation outcomes. Advanced technologies now allow us to accurately and cost-effectively assess conservation achievements such as improvements in water quality. For example, programs structured similarly to FieldDOC and WaterReporter (www.chesapeakecommons.org, accessed 19 Jul 2019) likely will revolutionize conservation assessment and planning. That increasing reliance on science and management tools is essential to improving outcomes and telling the story of conservation success.

Second, we should move to investment models that ask for a greater environmental return-on-investment (e-ROI) instead of spending like entitlement programs. Many of our conservation outlays are allocated to distribute money across the country. It makes sense to "share the wealth" to build the base for political support, but it may not be the best way to achieve the desired conservation outcomes. We all recognize that not all land is created equal, and conservation benefits from different management actions have wildly different outcomes.

We should shift to a conservation investment system that asks which places and which management actions will produce those outcomes we desire more effectively and do so in a manner that protects land best-suited for agricultural production. The decision-support technology to support this shift is well along. Producers have been using advanced technology for nearly a generation to select which inputs to invest in on which acres (or subacre) to maximize yields or even more appropriately profits. Precision Global Positioning System, yield monitors, high-resolution mapping, and sharp-pencil analytical tools are well-established in agriculture. A variety of these kinds of tools are now being deployed to focus conservation investment. Conservation decision support is now available through many advanced tools such as TruTerra, AgSolver, and the recent partnership announced by the Climate Corporation and Pheasants Forever (Bedord 2019). These tools are not perfect, but they are improving and will likely advance substantially in the next few years.

Developing the technology alone will not be enough. We have to adapt our own views to move to a greater e-ROI metric. That cultural shift has occurred in some agencies—it needs to penetrate the conservation community. The NRCS is well along in moving to a systems approach to conservation delivery that recognizes many programs need to be targeted. The vast majority of conservation programs are very oversubscribed, so it is possible to make selections on investments where they are most productive. Of course, people will always have favorite places and affinities for some lands and actions above others. Some landscapes may have their own surpassing public significance that goes beyond pure science. But these factors must be balanced with solid metrics as we allocate scarce resources to achieve conservation objectives.

As we move to measuring conservation effects, and improving conservation investment strategies, we will be able to tell a better story about what taxpayers get from a more effective use of government expenditures. The public broadly supports improvements in the environment; however, Americans deserve solid information to dispel skepticism and assure them their conservation investments are yielding real results. We need clear, firm answers about outcomes that people can understand. A relatively small portion of the electorate has done the heavy lifting to support conservation funding.

We Need to De-silo Conservation

The wildlife community has carried much of the burden in promoting funding for the Conservation Title and other key conservation programs. We must recognize the power of partnerships to achieve objectives beyond any of our abilities. Although the Conservation Title has done a tremendous amount to improve water quality, the wildlife community commonly does not recognize how much water initiatives have improved, and can further improve, other conservation objectives such as wildlife populations and habitat.

The EPA State Revolving Funds (SRF) set up under the Clean Water Act and the Safe Drinking Water Act constitute

one of the largest sources of public environmental funding. The SRF finances municipal water infrastructure. Since 1987, these funds have together provided >US$155 billion (US$133 billion and US$22 billion, respectively; see www.epa.gov/cwsrf/clean-water-state-revolving-fund-cwsrf-reports and www.epa.gov/drinkingwatersrf/drinking-water-state-revolving-fund-national-information-management-system-reports, accessed 19 Jul 2019) to protect the nation's waterways, address water quality issues, and safeguard municipal water supplies. Many states use SRF funding, some in quite innovative ways, for green infrastructure and watershed projects that provide significant protection to wildlife habitat and associates conservation lands while enhancing water resources. In the United States, examples range from New York City's water supply in the Catskills and reservoir lands in New Jersey, to Ohio's water-restoration sponsorship program, and carbon-credit forest protection projects in California. Advancing creative partnerships with new sectors and constituencies likely will be one of the most effective ways to grow conservation funding.

We Need Innovation on Conservation Funding Sources

With significant constraints on federal and state budgets, increasing the funding base from government will be challenging. There could be some significant innovations to reverse this constraint, but without creative new approaches, prospects for increased government funding are doubtful.

Within limits of federal government funding, there are a number of potential strategies to seek increases. The innovation that allowed the creation of the Conservation Title came from a savings strategy that actually reduced federal expenditures. In the early 1980s, the federal government was actually subsidizing the breaking out of additional highly erodible acres for conversion to commodity crops and draining of wetlands for conversion. This subsidy principally was through the payment of price supports for commodities produced on these lands. Not only was there a direct expenditure to increase lands enrolled in commodity crop production, but the government paid a floor price for surplus commodities and paid to store and ultimately dispose of surplus food commodities. This placed a tremendous burden on the taxpayer while causing environmental harm. Terminating this set of subsidies not only reduced federal spending (which was used to offset innovative conservation programs) but removed the government subsidy of environmentally destructive practices. The law enacted in 1985 precluded payments for agricultural produces from newly converted highly erodible lands or wetlands. The termination of these subsidies more than offset the new expenditures for conservation. Innovative strategies that reduce federal expenditures could be widely supported in the current political atmosphere.

We need investments that are also smart fiscal policy. For example, a recent study titled *Wetland Reserve Easement Program economic assessment: estimated commodity program and crop insurance premium subsidy cost avoidance benefits* (Lawrence 2018) showed that cropped former wetlands enrolled in the Wetland Reserve Easement create economic benefits by reducing costs in commodity, Federal crop insurance, and Noninsured Crop Disaster Assistance programs. In Mississippi, USA, for example, the study found that benefits of farm-program-payment cost avoidance were greater than costs associated with the Wetlands Reserve Easement acquisition and wetland restoration. Specifically, the research showed that the cost avoidance benefits (present value of avoided costs less the Wetlands Reserve easement and restoration costs) for Mississippi was US$870.08/acre. Although not evaluated in the Project, enrollment in the program also creates a wide range of other benefits related to flood mitigation, wildlife habitat, hunting and outdoor recreation opportunities, groundwater recharge and improved water quality, among other benefits (Lawrence 2018).

The chronic underfunding of the LWCF, and the diversion of much of its annual funding to unrelated spending, could be resolved simply by dedicating LWCF spending to ensure that its annual deposits actually go to their intended uses. This too will require a recalibration among the host of different constituencies for LWCF's on-the-ground project benefits, and across the array of conservation initiatives under the LWCF banner. The best opportunity to protect LWCF's revenues from being raided for nonconservation deficit spending, and achieve full dedicated funding, may lie in more clearly demonstrating the individual and collective impacts of LWCF's projects on habitat conservation, water quality and supplies, cultural resource protection, working landscapes, community flood and fire protection, and local and national economic health. By quantifying and maximizing these benefits, the political base of this key fund could be strengthened and raids on its funding base reduced.

New Finance Models Needed

a. In the past 20 years, there has been an active effort to advance innovation in ecosystem and conservation finance. Creating multiple mechanisms to facilitate the "Commerce of Conservation" is an important opportunity. Markets are very good at selecting approaches with a greater ROI. Broader use of market principles within government programs can help deliver improved e-ROI for existing conservation activities. Developing innovation beyond government should also be a priority. Mitigation banking is one example of major success in deploying market tools (www.epa.gov/drinkingwatersrf/drinking-water-state-revolving-fund-national-information-management-system-reports, accessed 19 Jul 2019). Prior to the issuance of the U.S. Corps of Engineers-led regulations on operation of mitigation banks in 1995 (U.S. Corps, EPA, NRCS, FWS, and NMFS 1995), this approach had produced only very limited large-scale action. Today it is a mature US$2+ billon/year industry (National Environmental Banking Association, (https://environmentalbanking.org, accessed 19 Jul 2019). Mitigation banking is designed to offset environmental effects. It may require a larger offset than effect. For example, there are commonly 2:1 requirements to bank mitigation, meaning that more (in this example, twice as many) environmental "units" have to be produced than consumed.

Mitigation banking is a tool to offset effects rather than create environmental lift, so it has limits as a tool to enhance conservation delivery unless mitigation banks projects are targeted to the most significant lands and waters. Mitigation banking is a great precursor to broader markets because it has tapped into a substantial market demand and meets needs at reduced costs.

b. Ecosystem Service Markets have been an objective of the conservation finance community for ≥20 years. Costanza et al. (1997) noted the value of ecosystem services and need to build them into economic systems. Since 2008, there has been a major national biannual conference on ecosystem services that has included market development and deployment as a key component. Originally known as "A Conference on Ecosystem Services," this biannual meeting is now known as "A Community on Ecosystem Services" (see https://conference.ifas.ufl.edu/aces08/presentations.html and https://conference.ifas.ufl.edu/aces/index.html, accessed 19 Jul 2019).

Ecosystem Service Markets have the potential to be a significant new funding source for conservation investments. To date, however, those markets have not developed as hoped (Electric Power Research Institute, http://wqt.epri.com/reference-shelf.html, accessed 19 Jul 2019). We must overcome a series of impediments if they are to be scalable. One of the impediments has been the reluctance of consumers of ecosystem services to pay for something they may get for free (The Economist, www.economist.com/babbage/2012/07/13/pricing-natures-freebies, accessed 19 Jul 2019). However, ecosystem service markets can be a way to achieve environmental performance at a reduced cost, thereby saving corporations, utilities, municipalities or other ecosystem users, and permit holders money.

For ecosystem service markets to work, there are many components that need to be in place that in part mimic the operation of other contracts and markets. These include:

i. Clear property rights
A producer of an ecosystem service credit must have the ability to own and potentially transfer those rights to another party. If there is not clear title and a clear understanding of the validity of transaction in that commodity, a market cannot exist. For example, someone does not have the right to sell property belonging to another. In another example, a commodity cannot be sold that is not socially acceptable—think of restrictions on "blood diamonds" or elephant ivory. Fortunately, there is growing recognition that someone who produces a net increase in environmental services can have ownership of that commodity and the right to transfer it to another. It should be recognized that there are some parties who oppose the transfer of environmental credits, labeling it 'pollution trading.' This property right has been tested in the courts, but the adjudication process doubtless has not been exhausted to date.

ii. Buyers interested in acquiring those rights
It is the lack of buyers that has been one of the major impediments to commerce in ecosystem service to date. There does appear to be growing interest from buyers to meet several demands highlighted below, but it is not yet clear that these markets will emerge at scale in the near future. Buyers may be interested in acquiring ecosystem service rights for a number of reasons. Among those could be lower cost of compliance with regulations, offsetting footprint impact (both internal to the institution and external such as supply chain mitigation), meeting social responsibility commitments, protecting the 'right to operate' and branding values. It is anticipated that the key driver to deliver the service will eventually become lower cost. To date, that has proven to be the case in only limited cases. Currently, the nation's largest water-quality trading program has been operated by the Electric Power Research Institute. This project has developed many model benchmarks that have informed the market, and has also noted a lack of buyers as an impediment to large-scale action.

iii. Clear agreement on the 'commodity'
A buyer and a seller must clearly understand what they are transacting and the units of measure to be used. Similar to a barrel of oil, there has to be an understanding and agreement on the specifications of the commodity. Is it light sweet crude or heavy bunker oil? A unit of greenhouse gas may easily be quantified in terms of CO_2 equivalent, but what is a unit of water quality? One buyer of water quality may need to reduce nitrogen and another may need to reduce a different class of loading such as sediment. What is a unit of biodiversity and does it apply across differing ecosystems? Both buyers and sellers must clearly understand and agree on the specifics of the unit being transacted.

iv. Verification
For ecosystem credits to be transferred for value, most buyers or exchanges require verification. Verification is commonly provided, and often required to be, a third party with expertise in that ecosystem credit. Unfortunately, the verification process is commonly expensive. The U.S. Department of Agriculture office of Ecosystem Service Markets notes that verification cost commonly make up approximately 80% of the cost of an ecosystem service transaction. This high overhead cost not only adds significantly to the overall cost of the credit, reducing its value to a potential buyer, but also diverting financial resources away from the landowner or party delivering the ecosystem service. That means money is diverted away from financing conservation and into overhead that does not provide conservation. Reducing the cost and increasing the reliability and transparency of verification is a key requirement to advancing commerce in ecosystem services.

v. Clear policy
The federal policy to advance ecosystem service markets through water quality trading is over a decade old; however, until early 2019, the policy did not provide sufficient guidance to state agencies responsible for

administering the Clean Water Act to scale up these markets. There have been many demonstration programs, but only very limited true market successes. In February of 2019, the U.S. Environmental Protection Agency announced an update to the policy (www.epa.gov/newsreleases/epa-announces-new-water-quality-trading-policy-memorandum, accessed 19 Jul 2019). This policy update was specifically designed to encourage states to implement ecosystem service transactions as a regulatory compliance strategy.

vi. Value

To deploy these markets on a large scale, producers and buyers of the credits must receive value that exceeds alternatives. So for example, a point-source generator may be able to reach nutrient reduction requirements at a significantly lower cost by investing in conservation with agriculture. A conservation practice installed on a farm may have multiple ecosystem benefits, such as water quality and wildlife habitat. These ecosystem services can be segregated, or 'stacked,' to allow the market to service buyers with distinct needs. When transactions are with landowners such as farmers or foresters, the sale of ecosystem services can create an entirely new revenue stream. It can also be a critical mechanism for increasing conservation investment. Should climate variability increases, this ecosystem service approach to management can do more than reduce cost. It can also increase resilience and reduce social conflict.

c. A potential emerging innovation for funding focused on imperiled species, is the Recovering America's Wildlife Act (The Wildlife Society, https://wildlife.org/policy/recovering-americas-wildlife-act, accessed 19 Jul 2019). Similar to the LWCF, this legislation proposes to draw a dedicated fund from the extraction of energy and mineral resources from federal lands. The proposal seeks to direct US$1.3 billion annually to improve the management of species in significant decline through partnerships with state wildlife agencies guided by State Wildlife Action Plans. The legislation is designed to provide a regular and secure source of funding for management of species prior to listing under the 1973 Endangered Species Act. This legislation is based on the recommendations of a blue ribbon panel on sustaining America's diverse fish and wildlife resources (Association of Fish & Wildlife Agencies, https://www.fishwildlife.org/afwa-informs/resources/blue-ribbon-panel, accessed 19 Jul 2019). This team reached well beyond the traditional wildlife and environmental community to also include industry, academics, and political leaders. The legislation has not yet been enacted by Congress. It has cleared committee review in the House. It is not yet known whether it will be enacted by this Congress.

In addition to identifying new dedicated funding sources, a key innovation in this proposed legislation is to get ahead of managing species in decline prior to being listed under the Endangered Species Act. Once a listing occurs, the flexibility for management is significantly reduced and cost increased. This legislation does look for a mechanism to have a higher e-ROI over conventional policy.

CONCLUSIONS

Adequate funding of fish and wildlife conservation and other critical resource needs such as water quality is essential and important to the quality of life for all Americans. Historically, the United States has made major investments in a system of conservation that is recognized throughout the world. With the political, economic, social, technological, and environmental changes we are currently experiencing, this impressive system of conservation will not sustain itself without solving the many challenges it faces, especially with regards to funding. We all remain committed to this critical task of maintaining a system of conservation; however, it must constantly be nurtured because there is much competition for funding to manage this system and special interest groups seem to constantly have their own agendas that go well beyond the reason that these policies and funding levels were established. However, it is our duty as professionals in wildlife conservation to maintain—and improve upon—what the conservation leaders before us created. To do so, we must do a better job of being more involved in the political process, unify our collective strengths, and apply them to our common challenges and opportunities.

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