

# Proceedings from the Forum on Conservation Finance: CREATIVE APPROACHES TO SUSTAIN LAND AND WATER

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## EXECUTIVE SUMMARY

We take many ecosystem services, or the benefits humans derive from nature, for granted: clean water and wildlife habitat historically have been abundant and free. In times of increasing scarcity, however, the value of natural systems—and the cost of their loss—is becoming more apparent. With economic pressures such as subdivisions and mining competing for the same lands that provide open space and food, and with rising costs to manage natural disasters or pay for ecosystem services like water filtration, society is increasingly recognizing that conserving these resources is a worthy investment.

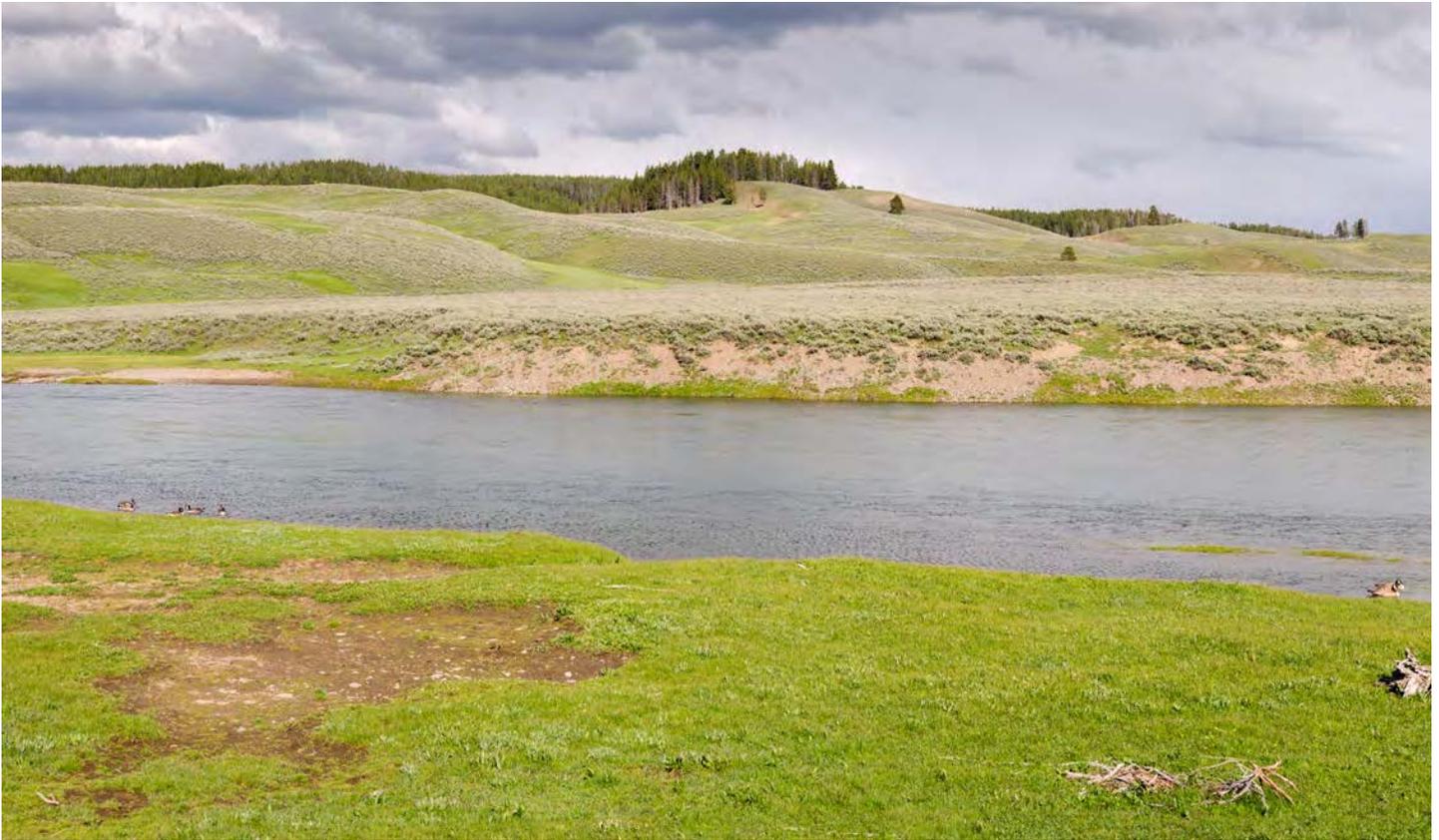
Conservation finance is how we pay to protect valuable ecosystem services. Harnessing philanthropic dollars to protect lands, such as through conservation easements, is a traditional approach to funding conservation. There are also newer, creative approaches emerging to finance conservation at multiple scales, from local ballot initiatives that support community parks to complex global markets for atmospheric carbon. In an era of constrained state and federal budgets, novel mechanisms to fund conservation will be required to leverage both public and private dollars.

As we explore new conservation tools—conservation credits, mitigation banking, payment for ecosystem service markets, and

more—there is a growing need in Wyoming and beyond to better understand these options. The Wyoming Forum on Conservation Finance sought to build an informational foundation about a range of conservation finance tools, both established and emerging. Speakers shared real-world applications, success stories, and challenges of various conservation finance models in government and the private sector to inform and inspire further practice of conservation finance in Wyoming.

The opening speakers for the Forum provided context for conservation finance in Wyoming and around the world, highlighting successful projects abroad and opportunities at home to draw on untapped resources and engage in conservation. The rest of the morning's speakers presented on the basics of conservation finance and explained tools and mechanisms as well as emerging, innovative approaches to fund conservation activities. Afternoon speakers highlighted on-the-ground conservation finance measures rooted in market transactions, from short-term purchases of instream water rights to endangered species markets. The day closed with a panel discussion about the successes and challenges of the Jonah Interagency Office (JIO) and Pinedale Anticline Project Office (PAPO) mitigation funds, and four panelists provided their perspectives on what lessons we have learned from these ambitious conservation finance programs that we can bring to future developments.

While the day provided a great degree of information on conservation finance, many questions were raised that warrant future discussion. Numerous speakers cited a need for strong biological metrics and accounting systems. In addition, there were requests for policy clarifications, specifically about the use of public lands in conservation banking and habitat credit exchanges. All stakeholders in Wyoming will need to be engaged in shaping the future of conservation finance in the state, including the energy industry, agricultural producers, federal and state land managers, academics, and citizens.



## SETTING THE STAGE: WHY WE NEED CONSERVATION FINANCE

Financing conservation has perhaps never been more precarious: in early 2013, federal agencies experienced sequestration budget cuts, the federal government cut mining royalty payments to Wyoming by 5% (\$53 million per year) and Abandoned Mine Land Fund payments by 10% (\$1.5 million per year), and the U.S. economy was still climbing its way out of the “Great Recession.” At the state level, a drop in natural gas prices greatly impacted the state budget, and in 2013 the state legislature slashed state agency budgets by 6%. The Wyoming Game and Fish Department (WGFD), a large funder of conservation in the state, has experienced year-on-year budget cuts, with its budget shrinking \$6.6 million in the last two years and fiscal year 2014 promising additional cuts. Meanwhile, many large-scale oil and gas, wind, and transmission projects are being scoped and developed in Wyoming, and important landscapes remain vulnerable to development. In these challenging fiscal times, creative mechanisms to fund conservation in Wyoming are an imperative.

The opening speakers for the Conservation Finance Forum provided context for conservation finance in Wyoming and around the world, highlighting successful projects abroad and opportunities at home to draw on untapped resources and engage in conservation.

**Goal of Wyoming Energy Strategy:**

Wyoming will achieve excellence in energy development, production, and stewardship of its natural resources for the highest benefit of its citizens

**Leading the Charge: Conservation and the Wyoming Energy Strategy**  
 Nephi Cole, Governor Matt Mead’s Office

*Cole is a natural resources policy advisor to Governor Matt Mead, where he has been instrumental in putting together the Wyoming Energy Strategy. Note: This presentation was given before the release of the final energy strategy, which was made public on May 14, 2013. More specific detail of the final plan can be viewed at <http://energy.wyo.gov>.*

The Wyoming Energy Strategy seeks to design a path for energy development and conservation to coexist in Wyoming. The overarching goal of the strategy is: “Wyoming will achieve excellence in energy development, production and stewardship of its natural resources for the highest benefit of its citizens.” This goal reflects a desire for Wyoming to lead the country in responsibly promoting both energy development and conservation.

Of the Energy Strategy’s strategic themes, “Natural resource conservation, reclamation, and mitigation” contains initiatives most relevant to conservation financing (Figure 1). Specifically, Initiative 11A under “Mitigation” refers to developing a Wyoming off-site mitigation program for landscapes most likely to be adversely impacted by development. The strategy outlines a number of principles to guide the mitigation program, including: defensible baseline data, good science, and clear regulations; program flexibility; enduring, credible, and enforceable commitments; verification and monitoring; protecting economic competition; and employing adaptive management.



Figure 1. Wyoming Energy Strategy’s strategic theme of “Natural Resource Conservation, Reclamation, and Mitigation” and its objective areas

Cole spoke about the possible creation of a statewide habitat/mitigation exchange in Wyoming, where buyers (industry, agencies, organizations, or individuals) could purchase credits from sellers (mitigation banks, individuals, coordinated groups, organizations, industry) to offset temporary or permanent impacts to habitat. This market-based conservation mechanism could have a goal of “no net loss” of conservation, or maintaining the same amount of habitat acreage or quality around the state. The state government, most likely under leadership of the Wyoming Wildlife and Natural Resource Trust (WWNRT), could serve in the role of exchange broker and provide program guidelines, verify transactions, and provide assurances. A major future challenge that Cole identified for a habitat exchange or off-site mitigation program was creating appropriate metrics and management units.

## ***A Global View on Conservation Finance: Common Themes, Common Issues***

### ***Kenneth Lay, The Rock Creek Group, Former Treasurer of the World Bank***

*Lay is Senior Managing Director of The Rock Creek Group, a Washington D.C.-based provider of asset management services in developed and emerging markets to major institutional investors. Before joining Rock Creek in December 2010, Lay was the Vice President and Treasurer of the World Bank.*

Lay drew on his years of experience as treasurer of the World Bank and in the finance sector to provide an international perspective of conservation finance and demonstrate how government finance can attract conventional investment. He provided a number of examples of successful conservation finance projects around the globe (Table 1). Many of the projects depicted in Table 1 were financed by public sources, but as we enter a more constrained fiscal environment, he cautioned there will be more emphasis on financing conservation through private capital markets.

Given the wealth present in pension funds and mutual funds, tapping into private funds may be an important opportunity for funding conservation. Pension funds (\$30 trillion), mutual funds (\$25 trillion), and the insurance industry (\$24 trillion) represent some of the largest pots of private money. The state of Wyoming has \$6 billion in its sovereign wealth fund, the Mineral Trust Fund. However, fund managers tend to be risk averse and seek specific rates of return on their investments. While an investment’s environmental and social benefits can be appealing, they often do not translate into gains at the bottom line.

To overcome the disconnect between rates of return and environmental gains, investors need to either explicitly recognize the value of the non-monetary aspects of projects that bring environmental or social benefit, or they must be convinced that these environmental investments outperform traditional ones; that is, conservation must compete with traditional moneymaking ventures.

An innovative approach to conservation finance is The Nature Conservancy’s (TNC’s) Conservation Notes program. This program issues notes on the credit of the Conservancy, which are earmarked for state, national, and regional conservation programs. The World Bank’s Green Bonds are similar investment tools that seek market-based financial returns concurrent with environmental benefits—in this case, investments are made in a specified

Table 1. Successful examples of conservation financing

Project	Country	Details	\$ Spent
Loess Plateau Restoration Project	China	<ul style="list-style-type: none"> <li>Steep slopes and overgrazing led to a denuded landscape and high levels of erosion in an area that supports 50 million people.</li> <li>The entire area was restored/reforested, which addressed siltation problems and eventually led to the doubling of average income of people in the area.</li> </ul>	Stage 1: \$252 million Stage 2: \$239 million Funded through national (\$193 million) and development bank (\$298 million) funds
Eastern Anatolia Watershed Project	Turkey	<ul style="list-style-type: none"> <li>Sought to mitigate impacts to many generations of overgrazing at the headwaters of the Tigris and Euphrates Rivers.</li> <li>Helped recondition micro-watersheds and collaborated with communities and landowners to find alternative livelihoods.</li> </ul>	Total: \$121 million Funded through development bank (\$77 million), Global Environment Facility (\$5.1 million) and local government (\$33.6 million) contributions
Northern Aral Sea Restoration	Kazakhstan	<ul style="list-style-type: none"> <li>Lake had virtually disappeared—the project restored the northern part of the sea and the commercial fishery.</li> </ul>	Total: \$85.8 million Funded through national (\$21.3 million) and development bank (\$64.5 million) funds
Katahdin Forest Project	United States	<ul style="list-style-type: none"> <li>The Nature Conservancy purchased 241,000 acres of easements in Maine and allowed timber production on easements.</li> <li>Project also included refinancing debt for a paper company, which saved the company and the 1,500 jobs it provided.</li> <li>All land under easement accessible for recreation.</li> </ul>	Total: \$50 million Funded out of donated and endowed charitable capital

subset of World Bank operations that contribute to climate change mitigation and adaptation or address other environmental issues.

In addition, TNC’s Latin American Water Funds have become well known for their success in financing watershed conservation by demonstrating that the cost of conservation is much smaller than the treatment costs that would have been incurred without it (Box 1).

Lay also noted two examples in agriculture, one in Brazil and another in Australia, in which sponsors proposed to restore extensively degraded agricultural land with an investment program and altered grazing practices that would produce a competitive return for investors over a 10-year horizon while yielding “green” benefits with the extensive vegetation recovery in the project areas. He noted that these projects are ambitious, and the fundraising arduous, but they are entirely in the private sector and focused on institutional investors.

Lay summarized what he believes is needed to make conservation financing work:

- Creating compelling financial value propositions: the “triple bottom line” is not enough—there must be competitive conventional rates of return;
- Moving beyond the private equity opportunities that qualify solely for investors’ smaller “alternative asset” allocations (on which they require much higher returns) toward liquid tradable securities (e.g., pooled investment vehicles, securitization) that qualify for the much larger, lower-risk parts of institutional portfolios for which a much lower return is required;
- Minimizing policy uncertainty by identifying activities that are financially viable without specific (and often variable) government encouragement; and
- More efficiently using public funds and credit available from governments, which are facing increasing fiscal challenges.

### Box 1. The Nature Conservancy Latin American Water Protection Funds

TNC has now established 15 water funds in Latin America that seek to protect watersheds upstream of major cities. Watershed restoration potentially precludes the need to install water treatment facilities, which come at a much greater cost than habitat restoration. A key feature of these funds is strong local partnerships. Details of three specific funds are below.

Bogotá, Columbia	<ul style="list-style-type: none"> <li>• Program conserves and restores tropical Andean forests that line watersheds that supply water to Bogotá’s 8 million people</li> <li>• Funded by voluntary contributions from water treatment facilities that will save on water treatment costs; expected to raise \$60 million over 10 years</li> </ul>
Quito, Ecuador	<ul style="list-style-type: none"> <li>• Program protects watershed that supplies 80% of freshwater to Quito’s 2 million people</li> <li>• Funded at nearly \$1 million/year by Quito’s water and electric companies</li> </ul>
Extrema, Brazil	<ul style="list-style-type: none"> <li>• Program pays farmers and ranchers upstream of São Paulo to protect and restore riparian forests on their lands, which improves the water quality and quantity to a watershed that supplies half of the city’s 11 million people</li> <li>• Funds collected from water users; landowners are earning ~\$31/acre/year for the water their forests are producing and filtering</li> </ul>



# THE BASICS: CONSERVATION FINANCE TOOLS AND STRUCTURES

What does “conservation finance” actually mean? What practices does it encompass? What are traditional conservation financing mechanisms, and what are new, emerging approaches? This session sought to lay an informational foundation for conservation finance and explain some of its basic tools and mechanisms and emerging, innovative approaches to fund conservation activities.

## Conservation Finance: Innovative Funding Strategies for Landowners and Communities

Story Clark, Consultant and founder of TravelStorysGPS mobile app

*Clark specializes in land conservation strategy and finance, and she advises conservation organizations and foundations in the Rocky Mountain Region and elsewhere.*

Clark energized the topic of conservation finance, or the “creative search for money to preserve land and create co-benefits.” She presented the field as a new way of thinking about what open land can do for society, for example, save us money, protect us from disasters, and offer ranches new revenue streams. Clark challenged the audience to think about community assets in new ways: how much is the land, water, wildlife, and open space worth? How can a community capitalize on these assets?

Valuing conservation often starts with putting a price on “nature’s capital,” or ecosystem services such as clean air, clean water, pollination, and erosion protection. The growing cost of using or replacing nature’s capital opens the door for creative conservation finance. An undeveloped watershed, for example, is a community asset that can be used to offset costs of expensive water treatment infrastructure (Table 2).

There are many examples of costs incurred by not protecting nature’s services: Hurricane Katrina’s damage was valued at \$148 billion, while it is estimated that restoring marshes that had buffered New Orleans would have cost \$20–50 billion, and Hurricane Sandy’s damage is estimated at \$71 billion, while a natural coastline could have helped prevent destruction. Conservation finance success would have been investing a fraction of those damage costs in restoration—before the funds were needed for relief and reconstruction.

“Conservation finance is the very creative search for money to conserve land, and by doing so, generate co-benefits to landowners, communities, and to each of us.”

Story Clark

### Ecosystem Services

The benefits that people derive from ecosystems, including:

Commodities	Food Fresh water
Regulating services	Flood regulation Water purification
Cultural services	Spiritual Recreational

Source: Millennium Ecosystem Assessment 2005

**Table 2. Watershed protection programs**

Location	Details & Method of Financing
Salt Lake City, Utah	<ul style="list-style-type: none"> <li>• Ratepayers pay a fee on their water bills that goes into a water protection fund</li> <li>• The fund purchases conservation easements in the Wasatch Mountains to protect the city's water supply quality</li> </ul>
New York City	<ul style="list-style-type: none"> <li>• In the 1990s, the city paid \$1.5 billion for conservation easements, stormwater management systems, and funding for local governments in the city's watershed</li> <li>• This investment prevented the need to build a \$6–8 billion water filtration plant that would have cost \$200–300 million per year to operate</li> </ul>
Raleigh, North Carolina	<ul style="list-style-type: none"> <li>• Mayor of Raleigh used ratepayer fees to fund seven land trusts that protect lands in the Upper Neuse River watershed, with the intent of maintaining the long-term health of the city's drinking water supply</li> </ul>
Eugene, Oregon	<ul style="list-style-type: none"> <li>• Oakshire Brewing donated 1% of proceeds from specific beers to the McKenzie River Trust to protect local watersheds that are the source of the brewery's water</li> </ul>

Another example of nature's services at work is honeybees, which pollinate two-thirds of the crops in the United States. It is estimated that in 2000, the pollination services honeybees provided were worth \$14.6 billion to the agricultural sector. Studies also report that access to nature and the outdoors have major human health benefits. With health issues like obesity (a \$152 billion national cost) and attention deficit disorder (ADD; a \$36.1 billion national cost) costing the nation billions of dollars per year, the costs avoided by investing in nature (e.g., paying for engineered pollination services or long-term healthcare) make a lot of economic sense.

Avoiding major future costs does not attract investors, as they seek to make money, not save money. To produce more money for conservation, communities need to see land and its resources as a collection of assets and strategically match the assets with their funding potential. Voters can help support conservation and have done so through local ballot measures, which have raised billions of dollars for conservation. Efforts can also be made to connect urban communities with natural landscapes and generate additional sources of funding. In addition to harnessing the power of these groups, policy certainty (such as in a national energy policy), proven financial returns, and additional science that can help maximize conservation values are important to continue to attract investment.

Clark closed by highlighting the importance of many bottom lines—human health, social health, and economic health—that are strengthened and perpetuated by conservation. She concluded with:

“We are only starting to understand how land can be used for sustainable purposes and the monetary, social and economic development value—not to say ecological value—that can result. We haven't even attempted to put a monetary value on nature for mental and spiritual health, for gaining perspective on our lives and understanding causal relationships, and our interconnectedness. As we in Wyoming

take stock of the assets we can monetize for conservation—from industry to tourism to soils to wildlife—and find ways of using science more and politics less to increase efficiencies in our conservation investments, we get closer to conserving the places we love for their own sake, for our sake, and for our children’s. This is the journey of Conservation Finance.”

## Habitat Exchanges

### Sara Brodnax, Environmental Defense Fund

*Brodnax is a policy specialist with the Environmental Defense Fund, where she works to promote policies that create economic incentives for conservation and improved stewardship of America’s working farms, ranches, and forestland.*

The Environmental Defense Fund and its partners are engaged in developing a number of wildlife habitat exchanges across the country, including the Upper Green River Conservation Exchange in Sublette County, Wyoming. Habitat exchanges are market-based tools to link those who can provide benefit to wildlife habitat with those interested in purchasing the benefits. These markets have thus far targeted candidate species for the Endangered Species List. The programs aim to recover the species’ populations in a cost-effective way, with the ultimate goal of preventing the need for listing or removing a species from the endangered species list.

The markets are performance-based and include credit quantification, verification, and monitoring components to ensure that conservation measures are meeting their intended targets. Rather than focusing on just implementing practices, such as prescribed burns, the exchanges focus on outcomes, such as numbers of greater sage grouse or amount of high-quality habitat. In a habitat exchange, outcomes are measured more directly, and incentives are provided for achieving those outcomes. It has been shown that performance-based markets lower administrative and conservation costs, encouraging credit producers to innovate and find ways to meet conservation targets in the most cost-effective way. Because it is market-based



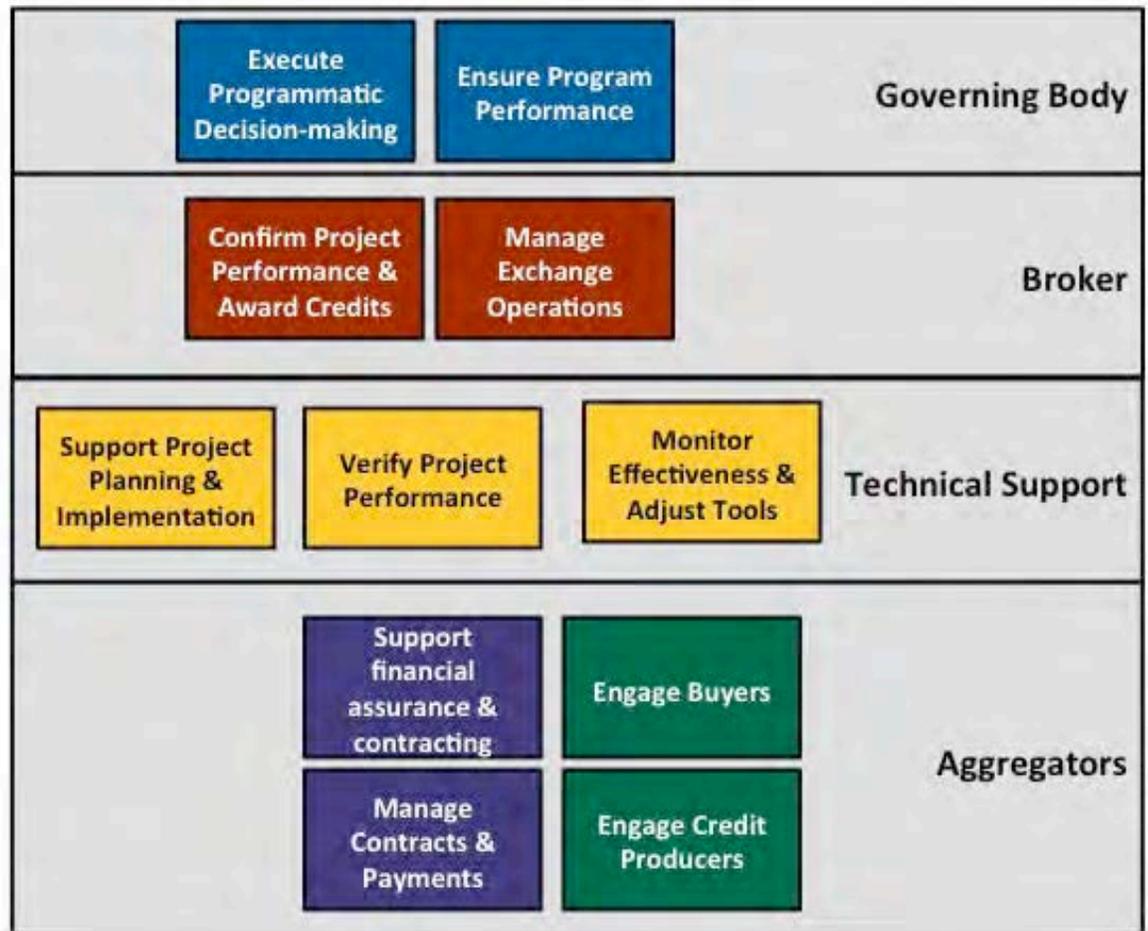


Figure 2. Potential market roles in a habitat exchange

and science-based, the exchange is designed to maximize the amount and value of conservation achieved while providing certainty and efficiency for those that need mitigation.

Credits in the habitat exchange are a measure of ecological currency that includes both habitat quantity (acres) and quality (conservation value) in units called “functional acres.” Scientists and experts are developing standard, science-based methods and tools to quantify and account for credits and debits (or impacts) in the habitat exchange. The land producing the credits and the land impacted by development use the same quantification approach, which takes into account habitat suitability for the species at both the site scale and the landscape scale (Box 2). Mitigation ratios, set by stakeholder groups and scientists, can be used to ensure a net conservation benefit. Credits can also be held in reserve to ensure that goals will be met even in the event of unforeseen setbacks, like natural disturbances such as drought or fire. Credits can be temporary for temporary impacts, or in perpetuity for permanent impacts. There are multiple market roles to ensure the market runs smoothly (Figure 2). The market determines the value of credits.

## Box 2. A Hypothetical Habitat Exchange Example for Greater Sage Grouse

An oil and gas company is considering putting wells on a 100-acre parcel in sage grouse habitat that is 100% functional at the site scale but deemed to have 50% habitat potential at the landscape-scale. After the project is developed, it is projected that 20 acres of habitat will be directly impacted by well pads and roads (0% site-specific habitat function) and 80 acres will be degraded to 50% suitable for sage grouse because of disturbance. This acreage still only has 50% habitat potential at the landscape-scale, so the total debit for the developer would therefore be 30 functional acres.

**Site pre-development:** 100 acres x 50% landscape habitat quality = 50 functional acres

**Site post-development:** 20 acres x 0% site quality = 0 functional acres

80 acres x 50% site quality = 40 functional acres

40 functional acres x 50% landscape habitat quality = 20 functional acres

**Total debit:** 50 functional acres (pre-development) – 20 functional acres (post-development)  
= 30 functional acres

In this case, the mitigation ratio has been determined by a scientific committee to be 1:1.2 to ensure net habitat is created for the species. Therefore, the oil and gas company must provide 36 functional acres of mitigation.

**Mitigation requirement:** 30 functional acres x 1.2 = 36 functional acres

A landowner has 100 acres that he wishes to restore and offer as offsets in a habitat exchange. While the land is located in an area of the landscape that is very valuable for sage grouse, some of the land (20 acres) is currently of no habitat value for sage grouse at the site level, and the other piece of land (80 acres) is assessed to have 50% of site-specific habitat value. The landowner therefore starts with 40 functional acres.

**Landowner current status:** 20 acres x 0% site quality = 0 functional acres

80 acres x 50% site quality = 40 functional acres

40 functional acres x 100% landscape habitat quality = 40 functional acres

The landowner implements habitat restoration projects for sage grouse, and post-restoration, 100 acres are deemed at 100% site-specific and landscape habitat quality, totaling 100 functional acres. Looking at the change from the baseline condition, the landowner has 60 functional credit acres to sell.

**Landowner post-habitat improvement:**

100 acres x 100% landscape habitat quality = 100 functional acres

100 functional acres - 40 previously functional acres = 60 functional acres available to sell

The landowner can then sell 36 acres to the developer, 30 of which will be a direct offset to the disturbed land and 6 of which will be a net benefit of conservation, as established by the mitigation ratio. The landowner will also have 24 additional functional acre credits to sell to other investors.

**Market transaction:**

36 acres from landowner → oil and gas developer (30 acres direct offset, 6 acres net benefit)

24 acres → available for the landowner to sell to others that want credits

**Mitigation Bank:** *Mitigation and Conservation Banking: Sweetwater River Conservancy Introduction*

A site where restoration, creation, enhancement and, in exceptional circumstances, preservation of wetlands and/or other aquatic resources has occurred expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources

**Michael Fraley, Sweetwater River Conservancy**

*Fraley is a founder and partner in the Sweetwater River Conservancy and has extensive experience developing environmentally sensitive projects, including mixed-use communities and mitigation banks.*

Mitigation banking for wetlands and riparian areas is a tool that has existed since the 1970s and was regulated starting in the 1990s; conservation banking for threatened and endangered species appeared in the 1990s in California and the U.S. Fish and Wildlife Service (USFWS) released guidelines in 2003 for their creation and management. There are hundreds of mitigation and conservation banks in existence across the United States (Figure 3).

Banking is a compensatory mitigation tool that can be employed when all other impacts to a habitat cannot be avoided or minimized. There are two mitigation tools that traditionally have been used to compensate for impacts: 1) in-lieu fees and 2) mitigation banks. With in-lieu fees, a developer impacting a habitat or species will pay a designated amount into a fund that supports research or conservation activities that offset impacts to the species. In contrast, for conservation and mitigation banks, a developer pays for credits generated at a bank that permanently protects land and often restores, creates, or enhances aquatic resources or wildlife habitat.

**Conservation Bank:** Some of the benefits of mitigation and conservation banks are that they consolidate smaller conservation projects into large, relatively intact land parcels, which may achieve greater

A parcel of land containing natural resource values that are conserved and managed in perpetuity for specified listed species and used to offset impacts occurring elsewhere to the same resource values on non-bank lands

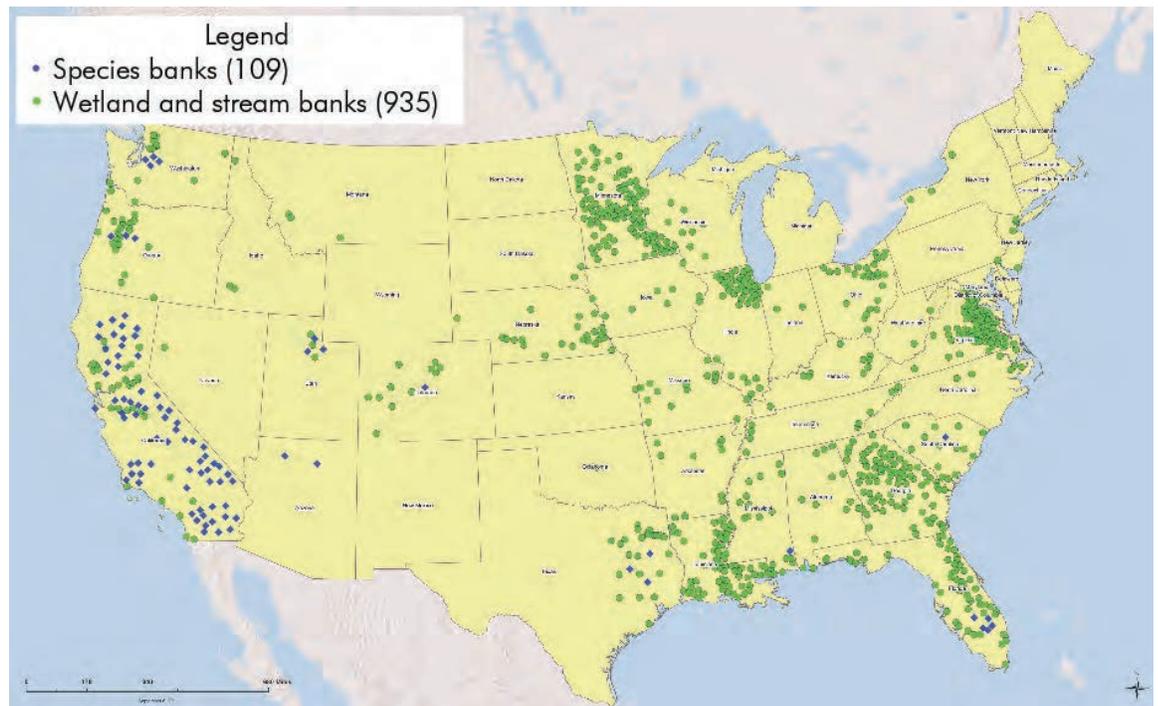


Figure 3. Mitigation and conservation banks in the United States

### Box 3: The Sweetwater River Conservancy Mitigation and Conservation Banks

The Sweetwater River Conservancy is a privately funded and held company. It has eight ranches in Wyoming that span 100,000 deeded acres and 750,000 total acres of mixed private/state/federal lands. These working ranches have diverse wildlife and habitat. The Sweetwater River Conservancy has proposed to create the first mitigation and conservation banks in Wyoming. To this end, it has collected three years of baseline data to establish existing wildlife and vegetation conditions on the ranches.

The Sweetwater River Conservancy has two banks under development: a wetland stream riparian bank and a sage grouse habitat conservation bank. The Conservancy submitted a prospectus for the wetland stream riparian bank to an Interagency Review Team (comprised of the U.S. Army Corps of Engineers, Wyoming Game and Fish Department, U.S. Fish and Wildlife Service, the Wyoming Department of Environmental Quality, and the Wyoming State Engineer's Office) and they hope to receive final approval on a banking instrument later this year. Once the bank is approved, the Sweetwater River Conservancy will undertake conservation activities to riparian areas and will measure the "ecological lift" achieved to determine the amount of credits that can be sold. As part of the banks, there are also financial assurances and conservation easements or other deed restrictions required for the land. After credits are sold (potentially to state and federal agencies, as well as energy and mineral developers), the conservancy must continue to monitor the sites. Approval of a wetland/riparian mitigation bank is imminent, and the Conservancy hopes to begin the permitting process for a Sage Grouse Habitat Conservation Bank in the summer of 2013.



#### Box 4. Pathfinder Field Trip, April 3, 2013

A group of forum participants traveled to the Pathfinder Ranch to visit a stream restoration demonstration site and learn in more depth about conservation and mitigation banking.

Mark Sattelberg from the U.S. Fish and Wildlife Service gave an overview of the process to establish wetlands/riparian mitigation banks or threatened or endangered species conservation banks. He explained there is a big market for conservation bank credits, and there are currently ~120 conservation banks in the United States that cover 60 species and protect ~100,000 acres.

Michael Fraley from the Sweetwater River Conservancy gave an overview of work that has been done at the Horse Creek Restoration site, including three years of baseline monitoring, rechanneling, removing invasive species, and planting willow and other riparian plants. Since they have begun restoration in late 2012, trout have recolonized the stream, turbidity and temperatures have dropped, and the water table has risen.



Figure 4. Forum participants at the Horse Creek restoration site on Pathfinder Ranch

conservation success and work toward landscape-scale conservation goals. In addition, the mitigation practices should be complete in advance of exchanging credits, meaning the mitigation is in place prior to impact. Mitigation and conservation banks also require financial assurances in perpetuity.

General features of mitigation and conservation banks are:

- They are governed by a mitigation banking instrument (or conservation banking agreement) that is approved by an Interagency Review Team comprised of federal and state agencies. Each instrument includes a development plan, management plan, financial assurances, credit/debit methodologies, and a description of the market area, or geographic service area.
- The geographic service area defines the boundary in which credits can be sold, and it is generally defined by watershed (8-digit Hydrologic Unit Code, or HUC), ecoregion, species range, or other scientifically justifiable rationale. Out-of-service area transactions can occur, but usually at a higher mitigation ratio.
- Mitigation ratios, or multipliers, are often included with mitigation bank credit transactions. An example of a credit ratio is 1.2:1, or purchasing 1.2 acres of credits for every 1 acre of habitat impacted. Credit ratios can help ensure there is no net loss of habitat and/or can offset uncertainties, such as natural disasters that impact the bank habitat.

The motivation for developers to purchase conservation and mitigation bank credits is that they are purchasing a federally regulated product that relieves them of mitigation responsibility: once a credit is purchased, it is the sole responsibility of the banker to provide the ecological services for mitigation. Purchasing credits also saves time and money for developers, who can build in the costs of mitigation upfront and go through permitting more quickly than if they were designing their own mitigation projects.

## **Leveraging State Investment with Public Support**

### **Bob Budd, Wyoming Wildlife and Natural Resource Trust**

*Bob Budd is the Executive Director of the Wyoming Wildlife and Natural Resource Trust, a program established to enhance wildlife habitats and the natural resource heritage of Wyoming.*

The Wyoming Wildlife and Natural Resource Trust (WWNRT) has invested over \$40 million in conservation in Wyoming over the past seven years. In total, with matching funds and landowner contributions, it has leveraged \$343 million in conservation investment throughout the State of Wyoming.

Budd expressed that in the future, the state has a responsibility to continue to help the development of a conservation market but also to “get out of its way” and not over-regulate it. Successful conservation programs will employ systems thinking and keep the big picture of whole rivers and ecosystems in mind. Projects should seek the most “biological leverage” possible, or try to maximize habitat and habitat credits for the money put in. It is also

important to recognize that once destroyed, it is difficult to get a resource back and offsets do not address on-site impacts. As a result, we will need to take a two-pronged approach that conserves existing habitat, while at the same time seeks to restore habitats that have been impacted by disturbances such as wildfire, invasive species, and other influences.

The public benefits of conservation are too often limited by considering only public recreational access, but there are many forms of public benefit for conservation projects, including: 1) the ecological public benefit; 2) aesthetic public benefit; and 3) present and future economic benefit (i.e., protecting sage grouse will help keep oil and gas development and agriculture thriving). Conservation has present and future values, and some values conservation provides may never have a price.

Budd presented a conceptual model for how conservation finance in Wyoming should proceed in the future, with four primary components:

- 1) **Conservation needs to happen in the private sector.** The work of the Sweetwater River Conservancy is one example of this. Safe Harbor Strategies and its work in the Upper Green River Basin is another example. In the private sector, the market determines winners, not the government.
- 2) **The state must exercise its statutory authority over wildlife and water.** The state has an obligation to verify and provide assurances for any wildlife and water markets that may arise. The state also must verify and guarantee quality for any credits. This will assure that important habitat types are retained in the proper ratios and configurations to serve the species of interest.
- 3) **The federal government must provide assurances that those who are paying into a conservation bank are meeting their mitigation requirements.** The USFWS will provide assurances to those who buy/sell credits for candidate or listed species under the Endangered Species Act, and the Bureau of Land Management (BLM) should also be involved.
- 4) **We must determine who holds the money.** What entity holds the money for a habitat exchange or conservation bank is less important than the assurances that ecological credits are delivered and that mitigation requirements are met. While the WWNRT could hold the money in a market exchange, it may not be the best place for funds to be deposited. Conservation districts, non-profits, or other organizations could play this role as well. The key is to make sure that we do not create conflicting purposes by placing funds under the jurisdiction of inappropriate entities, or mixing funds that should be kept separate.

## Local-level Conservation Finance: The Sheridan County Ballot Initiative

Brian Kuehl, Vela Environmental

*Brian Kuehl is a Partner at Vela Environmental, a national environmental consulting firm.*

Communities that value parks, pathways, and open space are another conservation funding pool, and local-level conservation finance measures are thriving across the country (Table 3). In 2012, 81% (46 of 57) of local conservation ballot measures passed nationwide, showing bipartisan support for conservation activities.

Table 3. Examples of local-level conservation finance measures

Community	Amount	Type of Financing	Purpose
Bozeman, Montana	\$15 million	Bond initiative	Parks and pathways
Salt Lake City, Utah	\$47 million	Bond initiative	Parks and trails
Gunnison, Colorado	\$4.6 million per year	1% sales tax	Ranchland, parks, and open space protection

*For more information on local ballot initiatives nationwide, see [www.landvote.org](http://www.landvote.org).*

The Sheridan County Ballot Initiative is a national model for local-level conservation financing. In Sheridan, the idea arose to finance parks, pathways, and open space via an optional one cent specific-purpose funding initiative (i.e., adding a 1% sales tax to the county). In 2006, a 6th penny tax passed in Sheridan with 66% support, but it was uncertain if voters would support a similar tax in a time of economic recession.

In 2010, TNC and the Sonoran Institute commissioned Public Opinion Strategies, a Republican polling firm, to conduct a telephone survey of demographically and geographically representative Sheridan voters (registered as 19% democrat, 67% republican, 13% unaffiliated). They asked the poll respondents if they would support a special-purpose one-penny tax that would go toward parks, pathways, and open space protection in the county. Of those surveyed, 71% said they would support a one-cent tax if proceeds went toward parks, trails, and conservation, while just 62% said they would support the one-cent



tax if it went toward general revenue. Support was spread across political affiliations and age groups. Those surveyed ranked water issues as the most important conservation issue in the area, followed by protecting land threatened by development and protecting land that bordered riparian areas.

Post-poll, TNC and the Sonoran Institute publicized results and reached out to the media, county commissioners, and city government officials, which led to the Sheridan city council passing a resolution that \$250,000 per year of one-cent special purpose tax income would support water quality, parks, pathways, and recreation, with an additional \$15,000 per year going to the Sheridan Community Land Trust. County commissioners allocated \$20,000 of the revenue to the Sheridan Community Land Trust and \$20,000 per year for discretionary conservation activities.

In the actual election, 69% of voters voted for the one-cent ballot proposition, which was more than the 66% support the one-penny tax received in 2006—a time of much greater economic security. It is thought this greater support was due to the conservation designation for the funds. Thus far, funds from the one-penny tax have helped support the Sheridan Community Land Trust, fund creek restoration projects, and improve public parks and pathways. Benefits of the poll have been seen beyond the ballot measure as well, and it is thought that the support for open space seen through the poll helped zoning regulations pass that promote conservation-minded development for subdivisions and provide density bonuses for clustered development—land-use planning practices that promote open space.





## KEYNOTE PRESENTATION

### *Mark Gordon, Wyoming State Treasurer*

I believe good development equals good management equals good conservation and hence should be recognized and appreciated. Not too insightful perhaps, but the critical question is how.

Teddy Roosevelt put it differently early in the last century. He said, “Conservation means development as much as it does protection. I recognize the right and duty of this generation to develop and use the natural resources of our land; but I do not recognize the right to waste them, or to rob, by wasteful use, the generations that come after us.” It articulates the attitude of my late father-in-law who worked on Grand Coulee Dam and raised his 10 children to appreciate their natural heritage, spending time every summer camping in America’s national forests. My father-in-law was a child of the depression, a fearsome defender of the national forests, and a believer in the capacity of our country. The two concepts were linked in his mind.

The same might be said for Aldo Leopold’s notion that conservation is a state of harmony between man and the land. In some ways the folks I grew up with on my family’s ranch in Kaycee personified that understanding. They had learned that care of the land was a responsibility that would pay back in improved animal condition, better and more abundant grass, and just the joy of being outdoors in an environment rich with wildlife. These were people like my dad who remembered the skies growing dark from windborne dust or burning piles of grasshopper carcasses. These were the folks who taught me how to irrigate, gather cattle, hunt, and fish. All the while they were teaching me about erosion, carrying capacity, and the land. They were serious about what they did because they had seen what carelessness could bring. They too grew up in the shadow of the depression understanding conservation was a virtue and a necessity.

As I entered my teens, science became more and more of a powerful influence. It offered seemingly logical and reasonably straightforward solutions to problems like grasshopper

plagues with chemistry, or enhanced productivity with fertilizer inputs, or engineering more tillable area by straightening rivers. All these advancements seemed to make sense and yielded pretty impressive results, fortifying bottom lines. In retrospect, perhaps this was the time when, to paraphrase Wendell Berry, farmers became more a part of the economy and less a part of the land. Science was a valuable tool, offered a novel conceit, and seemed to fit the new ag industry. Meanwhile, the “green revolution” was unfolding as our economy began to wrestle with inflation. Inflation penalizes savers and encourages borrowing. We were encouraged to push ourselves further out in debt to keep up with the erosion of the dollar until land became more and more of a commodity and production more and more of a virtue.

But there was this odd science—ecology. It seemed to suggest that the reductionist thinking focused on yields could be myopic, that there could be unintended consequences.

As a nation we began to move to the cities and to cut our ties to the land. Because the land was less and less our home, it was easier to lose track of the meat of what we ought to be discussing and focus more on romantic constructs. Ranchers retrenched because they were under attack and environmentalists worked harder to curry public opinion with often-overstated criticisms. Neither side wanted to listen to the other.

I was struggling to find the common ground, the radical center, of the two communities. It was amazing that the people I had grown up with earnestly cared for the land, and the people attacking us were attacking us for the way we were doing it, to the point of suggesting the very best thing for the land was to remove people from it, to let it go back to “nature,” as if that were something better. Both sides were caught up more in the rhetoric than in the understanding that we live in a dynamic environment and that humanity is part of it.

Science gave way to politics, which began to drive natural resource policy. Consequently we often govern by prescription, subsidy, or regulation. Our method suggests a view of our resources as static and, to my thinking, wholly undermines the implicit responsibility Teddy Roosevelt alluded to.

There are policies that preclude, subsidize, and encourage sometimes unrealistic and inflexible activities, which in the abstract universe of policy make us feel good. Perhaps it is time we ask: who is the buyer and what is the exchange?

It is in answering these two concepts of how we finance practices that I believe we can ensure the best possible outcomes for conservation. For example, if the buyer is society by proxy of the government encouraging the practices it has defined as good for society, it must appropriate funds according to a set of priorities all thought to benefit the public. Consequently, “Conservation” becomes esoteric. A monetary value must be attached to every “Conservation” practice and a “Conservation Good” must be established to weigh the merits of each. This is public finance without a true marketplace and can often lead to disappointing results—to wit, Carbon Exchange.



The work our ranch company did in restoring a damaged ranch to ecological wholeness led to a sale netting almost \$50,000 dollars of carbon credits sold on an exchange that existed because of government policy, not because of an understood public need. I say “netted” because broker fees and other considerations harvested the balance elsewhere. As a consequence, an artificial market pushed a set of valuable practices but in a way where the incentives were misaligned, and some of the “profits” harvested away from the practices resulting in an unsustainable market.

Far more meaningful was the lease our ranch developed with the Ucross Foundation, Apache Corporation, and The Nature Conservancy. It was predicated on marketing our ability to deliver what the lessor desired. In our case, we had a buyer who recognized the value of an improved place and a healthier ecology and our lease was crafted to recognize progress towards those ends.

We took over from a lessee who had had to pay a “market” lease based on carrying capacity, a bunch of other formulae, and, by golly, what they were willing to pay. Their incentive was to eke the last profit from the soil. Ours was based on improving the ecological health of the land: we thought about how the commodities we were producing could best be produced within the context of improving the ranch’s ecological health. Conservation in context with practice as opposed to conservation imposed on practice.

The returns to the ranch owners, which had been diminished under the prior management, led to better watersheds, improved range condition, more stable streams, better hunting

and fishing, more wildlife. Our lease, while monetarily less than the prior lessors made up for the deficit in energy, repairs, and materials netting a better return on the operation for the Foundations. All of these concepts reflect the true wealth of a place much more than the monetary return it can generate. This is the proper context of conservation.

William McDonough, an architect by training, writes in his treatise, *Cradle to Cradle*, about post-Industrial Age manufacturing, that there should be an exchange between cities and their rural surroundings which values this wealth. But we live in a time of big government where we often socialize costs and privatize rewards. Oddly enough, we spend a lot to promote good things and then we revile those who take advantage of those same programs. It is as if the programs or the government subsidies are themselves the problem instead those things we want to fix. We treat the good and the bad with the same regulatory framework, not recognizing and encouraging good behaviors. Best management practices become a threshold instead of allowing for adaptive practices that can continually improve. We prescribe conservation good instead of encouraging good conservation.

In the examples I gave above I offered two scenarios: one where a public marketplace was established for a governmentally designed public good which has proven not to have legs and another wherein a private partnership led to a long-term relationship benefitting each party, the land, and society as a whole because the public good was recognized in the proper exchange with willing buyers and sellers. Moreover, everyone learned along the way so the practices improved with use rather than stagnating at a prescription.

So is there a roll for public finance in conservation? Yes!

But perhaps it is the model of Wyoming's Wildlife and Natural Resource Trust that seeks to enable partnerships with capital, not specified treatments. The trust is made up of citizens from around the state who carefully weigh alternatives and seek to engage or leverage these partnerships where possible. The marketplace is local and reflects the priorities of real people. Even if policy wonks might be discouraged, the investment is real, understood, accessible, and reflects more than just dollars or time. It respects commitment. Conservation becomes something the community engages in and considers more of its own rather than some esoteric notion from on high. This is an attitude we understand in Wyoming.

Thank you for this opportunity to discuss such an important topic and for what more I have learned today about it. I am not sure we have the perfect recipe yet, but with so many bright people working on it we are certainly making progress. I am thankful to live in a state where the issues we discuss today are so immediately recognizable and where our love of place is so strong.

Thank you.



## APPLIED EXAMPLES OF MARKET-BASED APPROACHES TO CONSERVATION FINANCE

The afternoon session sought to highlight on-the-ground conservation finance measures rooted in market transactions, beyond more traditional philanthropic activity. Speaker topics ranged from instream flow water markets in the West to established wildlife credit trading markets in Texas to proposed conservation markets in the Upper Green River Valley in Wyoming. Experiences from existing markets and markets outside of Wyoming can help inform future efforts toward establishing conservation markets in Wyoming.

### *Market Approaches to Water Management*

#### **Cory Toye, Trout Unlimited**

*Toye has worked for Trout Unlimited since 2006 and is currently director of the Wyoming Water Project.*

Peak stream flows and peak irrigation demand rarely align, and when irrigation demand creates low flows in streams and rivers it can gravely impact fish populations. To address this

issue, groups across the West such as Trout Unlimited are undertaking initiatives to provide for instream flow during critical times of the year to protect fish species.

Toye highlighted market-based conservation activities, such as purchasing or leasing water rights for fish. Instream flow transactions such as these require a state water code that is flexible enough to recognize non-consumptive use for wildlife species (Table 4). When water policies were created, the value of water instream to wildlife was not often considered, and codes require amendment to allow for the values society places on water now.

Table 4. Instream flow programs in select western states

State (year program est.)	Water code stipulations for instream flow
Washington (1992)	<ul style="list-style-type: none"> <li>• Washington Trust Water Rights Program holds private water rights in trust permanently or temporarily to benefit fish</li> <li>• Water right holders can sell rights permanently to conservation groups who dedicate them to instream flow</li> <li>• Rights retain their original priority (“first in time, first in right”)</li> <li>• Short (one year) leases are possible to protect fish populations during drought</li> <li>• 446 instream flow transactions have occurred between 1987 and 2007</li> </ul>
Montana (1973)	<ul style="list-style-type: none"> <li>• Possible to temporarily or permanently transfer rights for instream flow</li> <li>• 10-year maximum lease term if retiring irrigable acreage; 30-year lease term if irrigation efficiency included in transaction</li> <li>• Wasson Creek (tributary to Blackfoot River) good example of establishing minimum flow for a westslope cutthroat trout fishery and has a 10-year lease agreement to keep a minimum flow of 0.75 cubic feet per second (cfs) in the creek</li> <li>• 229 instream flow transactions have occurred between 1987 and 2007</li> </ul>
Colorado (1973)	<ul style="list-style-type: none"> <li>• Instream “beneficial uses” include enhancement of the environment</li> <li>• Existing senior rights may be transferred both permanently and temporarily to instream use</li> <li>• 47 instream flow transactions have occurred between 1987 and 2007</li> </ul>

In Wyoming, non-consumptive use of water is discouraged. Statutes have not been amended to include instream flow values, and there is no way to legally protect water left instream from downstream users or to sell rights temporarily for instream use. Trout Unlimited has lobbied for instream flow statutes in Wyoming, but thus far has been unsuccessful.

Because Wyoming statute does not allow for instream flow, Trout Unlimited has been working through other channels to keep water in streams for fish. First, it is possible to work with an existing 1986 statute to retire water rights permanently for fish, but this is a difficult concept to sell and has only occurred once in the state. Second, it can work to set up non-diversion agreements with landowners where there is no upstream water user. In these cases,

### Box 5. Example water restoration project in Wyoming: Grade Creek

Grade Creek, a tributary of the Smith's Fork River, previously had Bonneville cutthroat trout, but an old channel was diverted, filled in, and cultivated. Trout Unlimited upgraded the efficiency of the existing irrigation system to accommodate for changes, re-dug the channel, and put water back in the stream. Upon completion of the project, trout successfully recolonized the stream.



Figure 5. Restoring the channel at Grade Creek (left) and water returned to Grade Creek (right)

the landowners use the water in springtime, but in late summer TU pays them to leave the water in the stream. Instream flow district agreements are a third option, where a group of irrigators on a small tributary agree to establish and maintain a defined minimum flow for a fishery. This requires crafting a water management plan that provides for minimum flow while meeting bottom-line demands. Lastly, TU can design water efficiency and restoration projects (e.g., culvert replacement, replacing pushup dams with rock weirs to allow fish passage, and irrigation efficiency), and this is where the organization has put the majority of its energy (Box 5).

### Lessons from Texas: The Golden-Cheeked Warbler and Dunes Sagebrush Lizard

Brian Hays, Texas A&M AgriLife Extension

*Hays is an Associate Director of the Texas A&M Institute of Renewable Natural Resources with Texas A&M AgriLife Extension, where his primary areas of interest are implementing innovative conservation and management programs that support private lands and enhance long-term benefits to the public and species.*

#### Golden-Cheeked Warbler

Other states have successful habitat credit trading markets in place, and one of the first to be established was that for the endangered golden-cheeked warbler at Fort Hood, Texas, and

## Recovery Credit System:

A tool that allows a federal agency to develop and store conservation credits that can be used at a later time to offset negative impacts to listed species.



Figure 6. The golden-cheeked warbler

the surrounding area. The establishment of this Recovery Credit System (RCS) led to federal guidance from the USFWS for RCS systems, which was published in July 2008.

In 2006, 70% of the golden-cheeked warbler's (Figure 10) known population was on Fort Hood, an army base outside of Gatesville, Texas. On the base, 54,000 of its 200,000 acres were considered habitat for the golden-cheeked warbler, and many of those areas were needed for infantry training exercises. While conservation banks are a mechanism to provide offsets for impacting endangered or threatened species, the habitat impacts on the base would be temporary; the areas would be disturbed for a time and then recovered. Therefore, a new program was needed to provide for temporary impacts to endangered species. The Texas Department of Agriculture organized a working group to establish a program to use the area of five counties surrounding the base—almost all privately owned—to offset warbler impacts on the base. This program sought to turn a liability—the presence of an endangered species—into an asset for private landowners, while helping bird recovery.

To establish the market, policy, economics, and science committees were formed that were composed of federal and state government, academic, and non-governmental groups. The project was initially funded by the Army, Office of the Secretary of Defense, a U.S. Department of Agriculture Conservation Innovation Grant, and the U.S. Fish and Wildlife Foundation. Texas A&M Agrilife Extension provided project coordination, implementation, and outreach, along with all monitoring and validation. Some of the program's funds went into warbler research to learn more about impacts and the effectiveness of management practices.

For the exchange, the science committee determined a single credit to be 20 acres of highly suitable warbler habitat that was part of a >250 acre patch of habitat. Qualified landowners enrolled in the program voluntarily and entered into a contract with a foundation established specifically for the exchange. Landowners were required to contribute 25% of project costs as cost-share. Fort Hood could then choose projects and use credits it procured to offset impacts to warbler habitat on base.

Initial market transactions led to a high cost of recovery credits and short-term contracts with landowners, but as the program gained popularity, credit prices dropped and contract terms lengthened (Figure 11). At the end of the 3-year proof-of-concept stage, there were 14,000 acres under contract to provide habitat improvements and protect the warbler and total landowner contacts equaled \$1.9 million.

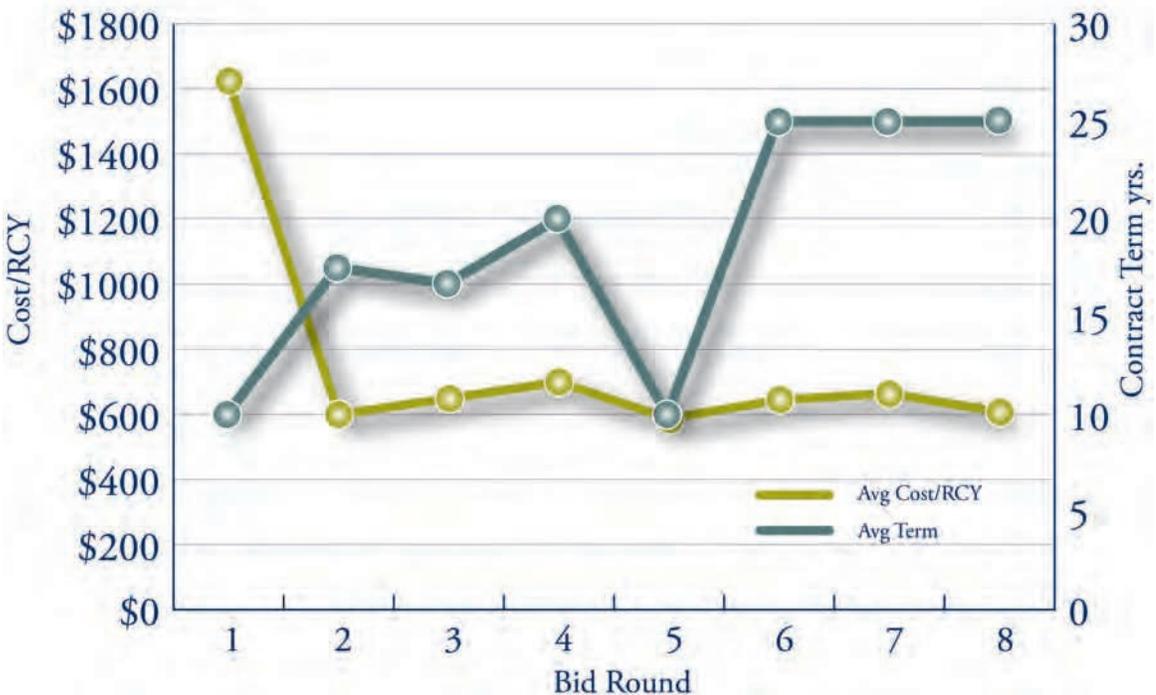


Figure 7. Trends of cost of RCS credit price and contract term over bid rounds (RCY = recovery credit year, or the product of the number of credits and the number of years of the contract)

### Dunes Sagebrush Lizard

Texas has also created a market-based conservation program for a former candidate species, the dunes sagebrush lizard (Figure 12). This lizard has a limited range in southeast New Mexico and western Texas, which overlaps closely with excellent oil and gas resources—60% of oil production in Texas occurs in four counties where the lizard is concentrated. Building on success of the RCS program for golden-cheeked warblers, in 2009 the Texas Comptroller of Public Accounts assembled an Interagency Task Force of Economic Growth and Endangered Species and again involved multiple stakeholder groups and science, economic, and policy subcommittees.



Figure 8. The dunes sagebrush lizard

**Mitigation/recovery activities for the dunes sagebrush lizard:**

- Invasive species management
- O&G surface location removal and restoration
- Road/caliche removal and restoration
- Reclamation of plugged and abandoned wells
- Removal of overhead infrastructure
- Purging pipelines
- Feral hog control program
- Relocation of infrastructure (centralization)
- Fence removal

The group created a plan for a Candidate Conservation Agreement with Assurances (CCAA), which is an agreement private landowners can voluntarily join that outlines management practices to enhance or restore habitat, remove threats, augment populations, or other actions beneficial to a target species. Landowners join the CCAA by signing a Certificate of Inclusion with the Texas Comptroller's office and agreeing to undertake certain conservation practices on their land. The terms of these agreements are confidential under Texas law. CCAAs benefit the landowners who sign them because they are not required to implement additional conservation

measures beyond those in the CCAA if the species is listed. CCAAs benefit a species because conservation measures on private lands take effect before the species is listed and potentially preclude its need for listing under the Endangered Species Act. A unique feature of the Texas dunes sagebrush lizard CCAA is that if the lizard is listed, the CCAA automatically turns into a Habitat Conservation Plan (HCP) that would further protect landowners from additional management responsibility under the Endangered Species Act.

While the Texas Comptroller's Office holds the CCAA permit and the trust fund (mitigation account), Texas A&M Agrilife Extension provides the implementation, outreach, and

accountability for the program and subcontracts with the Texas Habitat Conservation Foundation to negotiate landowner contracts, provide habitat assessments, monitor conservation practices, and oversee plans.

Oil and gas developers follow the mitigation hierarchy and attempt to avoid and minimize impacts to lizard habitat. To avoid impacts, they seek to relocate drilling sites based on the presence of lizard habitat. Minimization activities involve restricting disturbance to the fall/winter and utilizing existing infrastructure or previously disturbed sites. Agricultural producers reduce impacts to the lizard by utilizing Natural Resources Conservation Service (NRCS) prescribed grazing standards for the area and avoiding placing fences through the lizard habitat. They additionally minimize impacts by restricting access to certain sites and removing invasive species such as mesquite. Compliance monitoring for the program includes site visits, data collection/participant reporting, outreach/education, monitoring via correspondence, using aerial imagery, and utilizing Texas Railroad Commission records.

Participant fees pay for program management: operators that are drilling in or disturbing lizard habitat must pay \$4 per acre per year, while agricultural producers pay a total of \$50–\$100 per year, depending on their total enrolled acreage.

The lizard program also has a “Conservation Recovery Award System” in place, where credits can be generated to offset impacts to lizard habitat. For this system, there is a request for proposals (RFP) for projects to mitigate impacts to the lizard, and the project selected generates credits that are certified and held by the Texas Habitat Conservation Foundation and can be sold to developers who cannot otherwise avoid or minimize impacts. So far, none of these credits have been purchased, as companies have focused on the first two steps of the mitigation process (avoiding and minimizing impacts).

In all, the 240,000 acres enrolled in the CCAA represent 60% of the lizard’s habitat in Texas. The habitat ranges from very low to very high habitat quality for the lizard and includes buffer areas. In large part due to this program and its comprehensive plan for lizard conservation, the USFWS decided in June 2012 not to list the dunes sagebrush lizard and removed it from the candidate species list.

Hays closed his presentation with the primary lessons learned from these two conservation programs:

- Well informed, multi-stakeholder science committees are a requirement.
- Involvement of diverse stakeholders and partners, including representatives from relevant state and federal agencies is critical.
- A market-driven system provides flexibility.
- It is useful to build in a research component, funded in part by the program. New knowledge can then inform adaptive management activities.

**Payment for Ecosystem Services:**

An innovative, market-based approach to providing financial incentives or compensation to private landowners for engaging in environmentally or socially beneficial activities that might not otherwise be undertaken or continued

**The Upper Green River Conservation Exchange**

Kristi Hansen, University of Wyoming, Department of Agricultural and Applied Economics

*Hansen is an Assistant Professor and Extension Water Resource Economist in the University of Wyoming Department of Agricultural and Applied Economics.*

In Wyoming, there is an effort to set up a payment for ecosystem services market in Sublette County, called the Upper Green River Conservation Exchange (UGRCE; Figure 13). This exchange would focus primarily on water and biodiversity markets.

The exchange was first supported by a USDA Conservation Innovation Grant, and after conducting focus groups with buyers and sellers, three areas were identified as ripe for credit exchange: riparian function, mule deer habitat, and sage grouse habitat. In such an exchange, landowners would implement best management practices that are expected to result in improvement of existing high quality habitat and/or riparian function, and they would be able to sell those credits to offset impacts to similar resources elsewhere in the valley or county.

The market relies on voluntary participation of buyers and sellers. Buyers would likely be energy companies or conservation groups and sellers would likely be agricultural producers

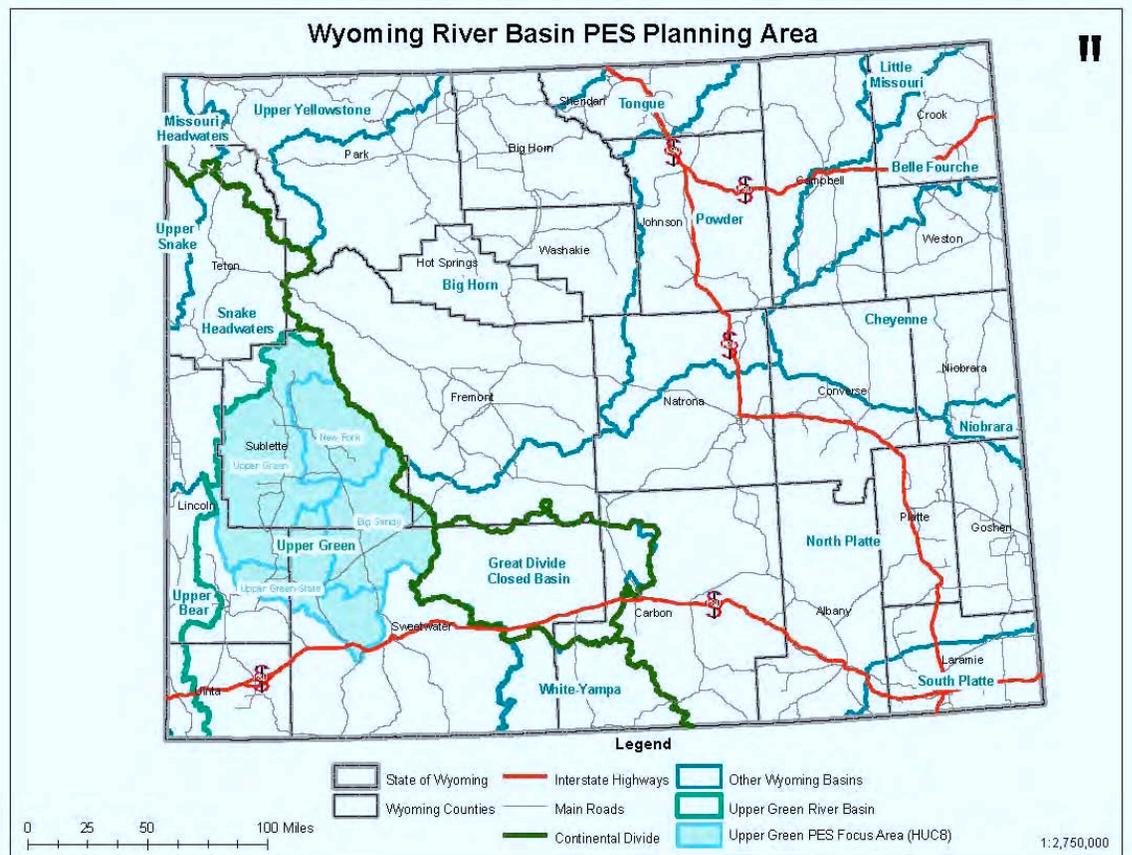


Figure 9. Upper Green River Conservation Exchange focus area (in blue)



and landowners. The market includes term leases; that is, contracts to generate credits can be temporary, for example for 10–20 years. Also, this market will focus on metrics and measurable results, basing design on the best available science. Under this paradigm, buyers know what they’re getting for their money and natural resources agencies know they’re getting the most conservation possible.

Unlike a conservation or mitigation bank, this exchange would have a broker to verify and aggregate credits and link buyers with credits. It would also be the broker’s responsibility to monitor the conservation activities to verify they were achieving their intended results. Science committees would set the terms for quantifying credits and debits for specific resources (e.g., riparian systems, sage grouse, and mule deer).

The UGRCE is currently in the pilot transaction phase. For the first pilot, Sublette County Weed & Pest sprayed herbicide for cheatgrass on private lands near Boulder Lake that are adjacent to public lands. The product of “cheatgrass eradication” was purchased by TNC. The exchange is seeking another buyer for additional spraying next year. In addition, it is investing in water improvements in the Little Sandy River to reduce sedimentation. Other pilot transactions involve a paper transaction built around changing flood irrigation practices and outlining what regulatory approvals would look like for upland sagebrush habitat credits. It is hoped the UGRCE will create a framework that can be easily transferred to other species and ecosystem services, depending on which species and ecosystem services become important in the future.

For example, the UGRCE model could be used to create a statewide market for greater sage grouse—a candidate species for the Endangered Species List—in advance of any kind of listing determination by the USFWS. If enough acreage were enrolled, such a market could eliminate the need for listing. These markets can be combined with CCAAs. There would be a number of different parties involved in this type of market (Figure 14).

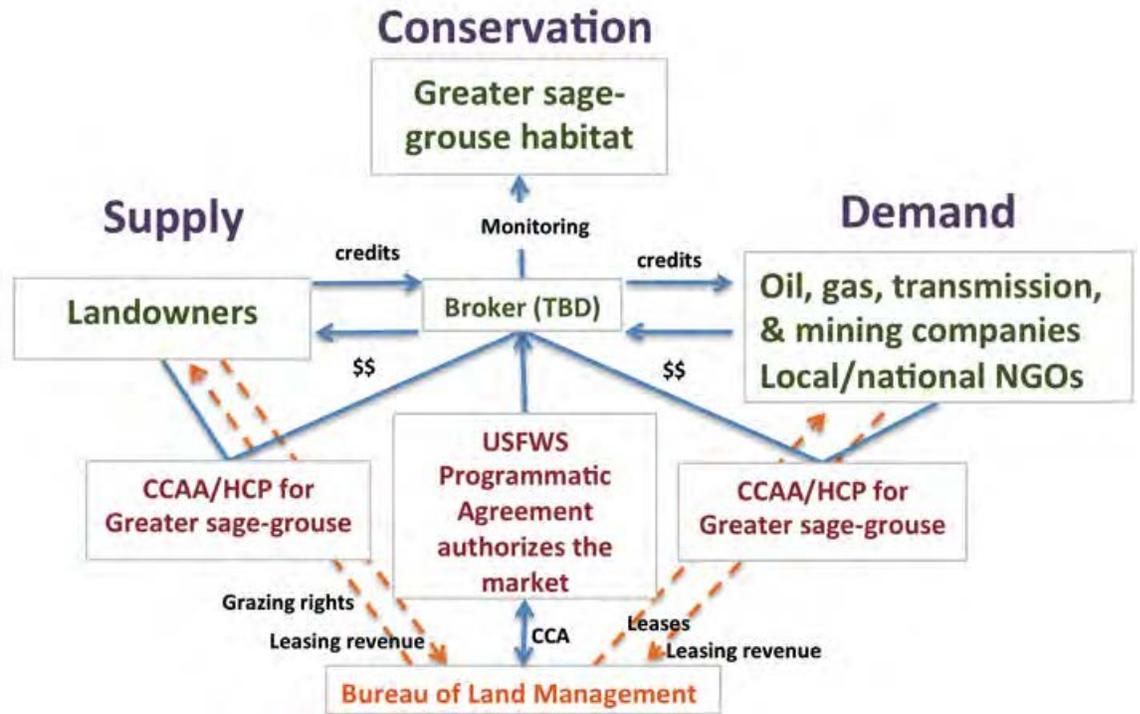


Figure 10. Possible structure of a sage grouse habitat exchange combined with Candidate Conservation Agreements with Assurances (CCAAs).

# PUBLIC-PRIVATE PARTNERSHIPS: LESSONS FROM WYOMING

Wyoming has been the site of a number of innovative natural resources management strategies, and the Jonah Interagency Office (JIO) and Pinedale Anticline Project Office (PAPO) mitigation funds are examples of first-in-kind schemes (Table 5).

The afternoon panel discussion provided an in-depth look at these major mitigation funds, and four panelists provided their perspectives on the success and challenges of these conservation finance programs. They sought to answer questions such as: if we could go back,

Table 5. Explanation of JIO and PAPO

<b>Pinedale Anticline Project Office (PAPO)</b>	<b>Fund max: \$36.0M</b>
<p><b>Purpose:</b> Established in 2008 to oversee mitigation and monitoring activities for the Pinedale Anticline Project Area, a large natural gas field that comprises ~300 square miles in western Wyoming. PAPO seeks to provide “overall management of on-site monitoring and off-site mitigation activities that primarily focus on mule deer, pronghorn, and greater sage grouse.”</p> <p><b>Funding:</b> A maximum of \$36 million, which the project area’s natural gas operators provide on a \$7,500 per-well-spudded (initiated) basis; as of August 31, 2011, \$16.5 million has been contributed.</p> <p><b>Example projects:</b> Mule deer winter range fertilization; conservation easements; wildlife-friendly fencing.</p> <p><b>Organizational structure:</b> Staffed by employees of the Wyoming Department of Agriculture (WDA), Wyoming Game &amp; Fish Department (WGFD), Wyoming Department of Environmental Quality (DEQ), and the Bureau of Land Management (BLM).</p>	
<b>Jonah Interagency Office (JIO)</b>	<b>Fund total: \$24.5M</b>
<p><b>Purpose:</b> Established in 2006 to oversee mitigation funds meant to offset the “major unavoidable impacts” of natural gas production from the Jonah Field in western Wyoming. Operators are authorized to have one drill pad on every 10 acres over the 30,500-acre field, with a project life of about 75 years. The project Record of Decision (ROD) authorizes 46 percent (14,030 acres) of the field to be disturbed at one time, with a rollover credit system for acres that have been reclaimed.</p> <p><b>Funding:</b> \$24.5 million specifically for off-site mitigation; funding is provided voluntarily by the area’s operators, primarily Encana. Of the total, \$16.5 million is to be used to mitigate wildlife impacts, and \$8 million can be used to mitigate other resource impacts, perform monitoring, or accomplish other activities.</p> <p><b>Example projects:</b> Conservation easements; message signs on roads in wildlife crossing areas; habitat improvement projects; prescribed burns; constructing raptor nest platforms and water trough bird ramps; wildlife friendly fencing.</p> <p><b>Organizational structure:</b> Staffed by representatives from WDA, DEQ, WGDF, and BLM.</p>	

Source: Jakle 2012

would we do it again? If so, what would we change? Should we do something like these funds again in Wyoming or in other states? What are the primary lessons learned?

### **Don Simpson, Bureau of Land Management**

*Simpson is the State Director for the Wyoming Bureau of Land Management, and he is a 38-year veteran of the BLM.*

Don Simpson spoke of the genesis of JIO and PAPO. For the proposed Jonah Field development, the well spacing was too dense to not have residual impacts on-site, and therefore required off-site, or compensatory, mitigation. An off-site mitigation fund was developed for the project to go forward. While deliberating the project, there were no guidelines for a mitigation program, though the literature pointed toward 3:1 offset ratios, which meant 90,000 acres of offsets that should be located as close to the 30,000-acre project area as possible. The \$24.5 million payment for JIO was paid upfront and went toward overhead for project management, as well as mitigation and monitoring activities.

For PAPO, the mitigation fund receives funds on a \$7,500 per-well-spudded basis. PAPO was developed with a mitigation matrix that contains mitigation trigger thresholds; for example, if a certain percentage decline in mule deer populations was found, additional mitigation activities would be required. The mule deer herd numbers did drop below the threshold to trigger additional mitigation activities, and Simpson said it has been a challenge to contextualize the decline, which points toward the importance of good baseline data collection pre-development and monitoring techniques.

For overall successes of the funds, JIO/PAPO are good examples of collaboration among state and federal agencies, which jointly manage the money and offices. It was also found that a coordinated monitoring effort among agencies and companies was very important. Challenges of the funds include: there were no mitigation banks or private mitigation providers to go to; there was no BLM-wide off-site mitigation policy to reference (one was created in 2008, partially in response to JIO); there wasn't much experience in monitoring; and there was not an established credit/debit methodology for mitigation.

For the future, there are some remaining challenges to work through, including determining 1) how companies receive assurances from the federal government that their mitigation plans will satisfy requirements, 2) if mitigation should happen before impacts, 3) when the money for mitigation is exchanged (before the project starts or after), and 4) how success is measured (e.g., acres, miles of fence, or numbers of leks). The Gateway West transmission project and Ruby Pipeline used the Habitat Equivalency Analysis credit/debit methodology, which is accepted by the USFWS and BLM, and this may be a useful accounting system to use for future projects. Simpson also advised companies that describing the known impacts of a project and how the company will compensate for them early on in the development process may gain them greater public acceptance and lead to a shorter National Environmental Policy Act (NEPA) assessment process.



Figure 11. Panelists, from left to right: Randy Teeuwen, Matt Kauffman, Holly Copeland, and Don Simpson

### **Holly Copeland, The Nature Conservancy**

*Copeland is a conservation scientist with The Nature Conservancy in Lander, Wyoming, where her research focuses on Western conservation issues such as forecasting the impacts of future energy development on wildlife and mitigation planning through the use of GIS and spatial modeling tools.*

The Wyoming Chapter of TNC became involved with the Jonah Field when in 2007 British Petroleum (BP) asked them to develop a mitigation plan. In collaboration with the BLM, WGFD, and a local consulting firm, TNC created this pilot off-site mitigation plan by using Marxan, a conservation planning software package that optimizes landscape-scale conservation. TNC used baseline data provided by project partners and BP to model likely impacts to the Jonah Field (assuming that all acreage was “lost” to wildlife) and the areas in Sublette County that would be appropriate for off-site, in-kind mitigation (see Kiesecker et al. 2009 and 2010). After this project, QEP Resources also asked TNC to conduct a similar analysis for the Pinedale Anticline. These projects helped guide strategic off-site mitigation planning for JIO/PAPO and helped generate focus areas to target off-site mitigation.

With a few years of JIO/PAPO mitigation experience, what are the benefits of the conservation activities that have taken place? Did they mitigate for what was lost? TNC is attempting to evaluate this by quantifying benefits of conservation work for sage grouse and mule deer. The majority of money from JIO and PAPO was put into conservation easements. Scientists and economists can model what may have happened on the easements in absence of conservation protections, therefore determining what net losses to species were averted. These analyses are ongoing.

## **Matt Kauffman, Wyoming Cooperative Fish and Wildlife Research Unit and University of Wyoming**

*Kauffman is the director of the Wyoming Cooperative Fish and Wildlife Research Unit (U.S. Geological Survey) and an assistant professor in the Department of Zoology and Physiology at the University of Wyoming, where he primarily works on ungulates in Wyoming.*

Matt Kauffman spoke primarily to the mule deer research he, his colleagues, and his students have conducted. The natural history of mule deer has made impacts from energy development difficult to mitigate. Migratory populations of mule deer winter on the Pinedale Anticline, where drilling is currently taking place year-round. Wintertime is when mule deer lose the fat they gained in the summer, and disturbance to their winter range likely causes them to lose fat stores more quickly, affecting population performance. Recent research has shown that deer have high site fidelity to seasonal ranges and migration routes, causing them to return to disturbed habitat on winter range. Long-term study of the deer that winter on the Pinedale Anticline has shown that deer still use the area in winter, but they show clear avoidance of high-traffic areas, such as roads and well pads.

While mule deer populations have declined generally in Wyoming and the Rocky Mountain West, the rate of decline of mule deer on the Pinedale Anticline is much greater than elsewhere. Scientific evidence clearly points to energy development as a major contributor to population declines, and it is likely additive to other factors.

Mitigation should follow the mitigation hierarchy of avoiding, minimizing, and then compensating for any remaining impacts. With mule deer on the Pinedale Anticline, avoidance wasn't an option: the natural gas is located under their winter range. There have been some efforts at minimizing impacts through drilling multiple wells from one well pad (directional drilling) and a liquids gathering system that reduces truck traffic. Compensatory mitigation that PAPO implemented includes conservation easements, wildlife-friendly fencing, water projects, and fertilizing winter range. Thus far, these projects have not shown near-term benefits to mule deer. With the exception of the conservation easement at the Sommers-Grindstone Ranch, which covers important migration corridors, the conservation easements have not been targeted in mule deer stopover areas, migration corridors, or critical winter range. In addition, the benefits of sagebrush fertilization are unproven, and were it to benefit mule deer, only 5% of impacted winter range has been fertilized. Overall, mule deer mitigation efforts on the Pinedale Anticline have failed to minimize or offset the impacts to wintering deer populations, which have continued to decline.

## **Randy Teeuwen, Energy Industry**

*Teeuwen is an experienced professional in community and stakeholder relations, media relations, and community investment and has worked for the energy industry for many years.*

Randy Teeuwen stated that energy development and conservation do not need to be mutually exclusive. Careful planning at the outset of a project with multiple stakeholders, including local citizens, can help reduce impacts of a project.

From the energy industry perspective, the JIO/PAPO mitigation funds have been both good and bad. Most agree that the conservation easements funded through JIO have been successful, specifically Sommers-Grindstone. However, there was a lack of monitoring and attempt to explicitly tie easements to a biological purpose. An issue energy companies have is the large amount of overhead drawn from the funds to keep the JIO/PAPO office running: JIO overhead is ~\$600,000 per year, and the energy companies want to see more of their money going toward mitigating impacts. In addition, when mitigation projects were determined, there weren't many local representatives at the table, and it is important to include the local community in decision making. In large part, however, it is difficult to determine the success of JIO/PAPO because there hasn't been a comprehensive analysis done on the return on investment per mitigation dollar spent.

Moving forward, assurances for energy companies remain a major part of the mitigation equation: companies must know that they will get credit for the mitigation they are supporting and that it will give them license to operate. Landowners, too, who provide mitigation services on their lands must know that federal agencies will credit them for that activity. For energy companies, financing conservation must be a good business decision. In the future, more baseline data, better metrics, and science-based monitoring are also needed to help better determine where mitigation dollars should go. Teeuwen closed with the thought that mitigation/conservation banking and habitat exchanges are a huge opportunity for Wyoming to fund conservation and continue with economic development.



## FUTURE DISCUSSIONS

The Forum on Conservation Finance raised a number of questions and areas for further exploration. The Ruckelshaus Institute, The Nature Conservancy, and the Stroock Forum will continue to host discussions on these topics and attempt to advance knowledge and decision making on conservation finance in Wyoming and the Rocky Mountain West.

### *Metrics: Bridging Science and Economics*

Multiple speakers mentioned the need for more robust quantification tools for habitat degradation and improvement that are scientifically rigorous and, when possible, consistent throughout the state. The Sweetwater River Conservancy has developed a set of habitat metrics, though it is a private company and some of its methods may remain proprietary. The BLM has used Habitat Equivalency Analysis on recent projects in Wyoming, and this is one habitat quality quantification method to look to. The Environmental Defense Fund is working on many habitat exchange efforts around the country and has gained expertise in habitat credit quantification. The Nature Conservancy has modeled impacts from energy development and benefits of conservation activities in Sublette County, but on a coarse scale. These disparate, but related efforts point to the need for discussion and collaboration—particularly among scientists and economists—that will be critical to creating a consistent methodology.

### *Conservation Finance Successes and Failures*

The JIO/PAPO panelists highlighted how little is known about the effectiveness of these mitigation funds and the conservation practices they have supported. Additional analysis on the biological benefit of conservation easements in Sublette County and practices such as sagebrush fertilization for mule deer winter forage deserve further study. Analysis could have economic, biological, and social components. What lessons have we learned from these innovative funds that can help us improve mitigation practices and target conservation funding in the future?

Throughout the day, forum attendees heard about water funds from around the world, stream restoration programs in neighboring states, and habitat protection and exchange programs for two species of conservation concern in Texas that are threatened by oil and gas development. However, there are many other case studies of creative conservation financing mechanisms. Gathering additional examples from around the country—and globe—will also help inform future practices in Wyoming. What practices have been tried, failed, and should be avoided? Can we model some of our conservation activities on successful programs in other states?

### *Policy Certainty*

National policies, such as off-site mitigation guidelines, conservation and mitigation banking policies, or habitat exchange guidelines provide more regulatory certainty for both development interests and those seeking to supply conservation and mitigation. At the national scale, a national energy strategy, guidelines for pre-listing habitat exchanges from the

USFWS, methodology for BLM off-site mitigation, and species-specific management policies will help guide decision making and determine where conservation dollars go.

At the state level, fleshing out initiatives in the Wyoming Energy Strategy will prompt the direction of energy industry–supplied conservation dollars, as will policies like the Sage Grouse Core Areas. The state can also help be a broker in habitat exchange market and provide assurances for those that purchase credits.

To create robust markets, we need to identify: where are the policy gaps at the local, state, and federal levels? Where do policies need to be strengthened or modified to send clear signals to conservation markets and development interests?

### ***Defining the Role of Public Lands***

It is unclear if privately funded organizations can undertake conservation activities on public lands and seek to profit from those activities. This scenario specifically applies to mitigation and conservation banks, and has large implications for their markets. Though not expressly prohibited, no one has yet tried to generate mitigation or conservation bank credits on public lands and sell credits for ecological uplift to private development interests. On one hand, allowing this practice would create another market activity for public lands and provide much-needed dollars to fund conservation activities on some of the most intact and large-scale habitat that remains. However, there are also market implications, as there would be no land cost or risk associated with the credit price and credits generated on public lands would cost less than credits generated on private lands, outcompeting them. This is an area that will need more clarification in coming years in Wyoming, as Sweetwater River Conservancy is interested in improving public lands for private profit. To what extent can private dollars fund conservation activities on public lands? How can we do this and protect the public interest?

### ***Additional Topics for Discussion***

All stakeholders in Wyoming will need to be engaged in the future of conservation finance, including the energy industry, agricultural producers, federal and state land managers, academics, and citizens.

When asked about possible future topics to explore in the future, forum attendees suggested pursuing these themes in more detail:

- Actual, present and available opportunities for cash to finance conservation;
- Partnerships, successful mitigation models, landowner perspectives, federal participation, CCA and CCAA models;
- Term-limited or temporary conservation contracts;
- Habitat exchange implementation and BLM and USFWS positions on habitat markets;
- The perspective of the natural resource management agencies in Wyoming, e.g., BLM, USFWS, WGFD, regarding limitations to developing conservation markets in Wyoming and how to address federal lands;

- The progress of mitigation banking in Wyoming and how it is viewed by government, conservation groups, the public, and industry;
- On the ground successes/demonstrations;
- Defining the types of practices for which there is a conservation value in the marketplace;
- A broader focus on how more stakeholders can benefit from or contribute to conservation finance, not just big business;
- How these financing or conservation models extend to protecting cultural resources;
- Perspectives of potential and real conservation buyers;
- Making sure the system is working properly from both the biological and financial standpoints;
- What conservation finance can do and what it can't do;
- How to inform agriculture and get acceptance from the agricultural sector; and
- Review lessons from outside the state (what is working and what is not).



# RESOURCES

## Publications

- Clark, S. 2007. *A Field Guide to Conservation Finance*. Washington D.C.: Island Press. [www.storyclark.net/i\\_a\\_field\\_guide\\_to\\_conservation\\_finance\\_i\\_64775.htm](http://www.storyclark.net/i_a_field_guide_to_conservation_finance_i_64775.htm)
- Copeland, H. and J. Keisecker. 2011. Sommers-Grindstone Ranch Rapid Assessment of Mitigation Value (February). [www.wy.blm.gov/jio-papo/docs/sommers-grindstone\\_mitigationvalue.pdf](http://www.wy.blm.gov/jio-papo/docs/sommers-grindstone_mitigationvalue.pdf)
- Duke, E.A., A. Pocewicz, and S. Jester. 2011. Upper Green River Basin Ecosystem Services: Feasibility Analysis Project Report. Lander, Wyoming: The Nature Conservancy. [www.nature.org/idc/groups/webcontent/@web/@wyoming/documents/document/prd\\_047272.pdf](http://www.nature.org/idc/groups/webcontent/@web/@wyoming/documents/document/prd_047272.pdf)
- Jakle, A. 2012. Natural Gas Development and Wildlife Mitigation: A Primer. Laramie, Wyoming: Ruckelshaus Institute of Environment and Natural Resources, University of Wyoming. [www.uwyo.edu/haub/ruckelshaus-institute/files/docs/publications/2012-natural-gas-wildlife-mitigation.pdf](http://www.uwyo.edu/haub/ruckelshaus-institute/files/docs/publications/2012-natural-gas-wildlife-mitigation.pdf)
- Kiesecker, J.M., H. Copeland, A. Pocewicz, and B. McKenney. 2010. Development by design: blending landscape-level planning with the mitigation hierarchy. *Frontiers in Ecology and the Environment* 8: 261–266.
- Kiesecker, J.M., H. Copeland, A. Pocewicz, N. Nibbelink, B. McKenney, J. Dahlke, M. Hollaran, and D. Stroud. 2009. A Framework for Biodiversity Offsets: Selecting Sites and Determining Scale *Bioscience* 59(1): 77–84.
- MacKinnon, A. 2006. Suitability of a program of compensation for environmental services for the rural Rocky Mountains. <http://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/285/AnneMacKinnon.pdf?sequence=1>
- Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Synthesis* Washington, D.C.: Island Press. <http://www.unep.org/maweb/en/index.aspx>
- National Oceanic and Atmospheric Administration (NOAA). 2006. Habitat Equivalency Analysis: An Overview. [www.darrp.noaa.gov/library/pdf/heaoverv.pdf](http://www.darrp.noaa.gov/library/pdf/heaoverv.pdf)
- Office of the Governor Matt Mead. 2013. Leading the Charge: Wyoming's Action Plan for Energy, Environment and Economy. [www.energy.wyo.gov](http://www.energy.wyo.gov)
- Sawyer, H., M.J. Kauffman, A.D. Middleton, T.A. Morrison, R.M. Nielson, and T.B. Wyckoff. 2013. A framework for understanding semi-permeable barrier effects on migratory ungulates. *Journal of Applied Ecology* 50: 68–78.
- Sawyer, H.S. and M.J. Kauffman. 2011. Stopover ecology of a migratory ungulate. *Journal of Animal Ecology* 80:1078–1087.
- Sawyer, H.S., M.J. Kauffman, R.M. Nielson, and J. Horne. 2009. Identifying and prioritizing ungulate migration routes for landscape-level conservation. *Ecological Applications* 19: 2016–2025.
- Sawyer, H.S., M.J. Kauffman, and R.M. Nielson. 2009. Influence of well pad activity on the winter habitat selection patterns of mule deer. *Journal of Wildlife Management* 73:1052–1061.

- SWCA Environmental Consultants. 2012. Habitat Equivalency Analysis for Mitigation of the Gateway West Transmission Line (June). [www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/cfodocs/gateway-west/sgAnalysis.Par.16126.File.dat/atch-1.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/cfodocs/gateway-west/sgAnalysis.Par.16126.File.dat/atch-1.pdf)
- Texas Comptroller of Public Accounts. 2012. The Texas Conservation Plan for the Dunes Sagebrush Lizard (*Sceloporus arenicolus*). [http://texasahead.org/texasfirst/esa/task\\_force/priority/pdf/DSL\\_Plan\\_021312.pdf](http://texasahead.org/texasfirst/esa/task_force/priority/pdf/DSL_Plan_021312.pdf)
- U.S. Army Corps of Engineers. 2008. Compensatory Mitigation for Losses of Aquatic Resources. *Federal Register* 73(70): 19594–19705.
- U.S. Fish and Wildlife Service (USFWS). 2003. Guidance for the Establishment, Use, and Operation of Conservation Banks (May). [www.fws.gov/endangered/esa-library/pdf/Conservation\\_Banking\\_Guidance.pdf](http://www.fws.gov/endangered/esa-library/pdf/Conservation_Banking_Guidance.pdf).

### **Websites**

- Candidate Conservation Agreements with Assurances, U.S. Fish and Wildlife Service: [www.fws.gov/endangered/what-we-do/cca.html](http://www.fws.gov/endangered/what-we-do/cca.html)
- Conservation Finance Course (free, online), The Trust for Public Land: [www.tpl.org/research/conservation-funding/online-conservation-finance.html](http://www.tpl.org/research/conservation-funding/online-conservation-finance.html)
- Ecosystem Marketplace: [www.ecosystemmarketplace.com](http://www.ecosystemmarketplace.com)
- Habitat Exchanges, Environmental Defense Fund: [www.thehabitatexchange.org](http://www.thehabitatexchange.org)
- Jonah Interagency Office and Pinedale Anticline Project Office: [www.wy.blm.gov/jio-papo/](http://www.wy.blm.gov/jio-papo/)
- Landvote Database, The Trust for Public Land: [www.landvote.org](http://www.landvote.org)
- Latin American Water Funds, The Nature Conservancy: [www.nature.org/ourinitiatives/regions/latinamerica/water-funds-of-south-america.xml](http://www.nature.org/ourinitiatives/regions/latinamerica/water-funds-of-south-america.xml)
- RIBITS (Regulatory In lieu fee and Bank Information Tracking System), U.S. Army Corps of Engineers: <http://geo.usace.army.mil/ribits/index.html>