PAYMENTS FOR ECOSYSTEM SERVICES

July 2014

Cases from the experience of U.S. communities

Cara Bottorff

FOREWORD

Payments for Ecosystem Service, or PES programs are defined as "formal and informal contracts in which landowners are remunerated for managing their land to produce one or more ecosystem services, [and that involve] actual payments between at least one willing buyer and one willing seller to produce or enhance a well-defined ecosystem service or bundle of services (Mercer, Cooley, & Hamilton, 2011, p. 1)." But what do PES programs look like in practice? How formal or informal does the payment mechanism need to be? And what ecosystem services (or ecosystem processes and benefits) are most amenable to these market-based or market-like approaches to environmental problems?

To help answer these questions for the benefit of landowners, community groups, local governments and businesses curious about whether such systems could become part of a strategy for addressing climate adaptation needs or other environmental concerns, Key-Log Economics has commissioned this review of representative examples of PES programs from around the United States. Our intention is to inspire ideas for how to connect the resources needs of those who can make improvements in the protection, restoration and enhancement of ecosystem processes to the resource capacity of individuals, businesses, governments, and communities who enjoy the benefits that spring from those processes.

Independent researcher, Cara Bottorff, has done an excellent job sifting through dozens of potential case studies and describing those that best illustrate the breadth of creative PES approaches underway today. Naturally, any set of cases will leave much good work unheralded, and I would encourage readers to do their own searching for further reading (start with the Bibliography at the end of this report) to get even more ideas as well as some solid how-to advice from researchers and practitioners who have been at the forefront of creating PES programs.

Spencer Phillips, PhD, Principal
Key-Log Economics, LLC

PAYMENTS FOR ECOSYSTEM SERVICES: CASES FROM THE EXPERIENCE OF U.S. COMMUNITIES

Cara Bottorff

July, 2014

For Key-Log Economics, Charlottesville, Virginia

keylogeconomics.com

Contents

OVERVIEW OF CASES AND KEY LESSONS

The cases included below include a wide variety of types of Payment for Ecosystem Services, or "PES" programs. The cases vary by payment type, ecosystem services involved, and the end goal of the purchase. The locales span the United States, from New York to California, and from Georgia to Washington, so they represent a sample of what the United States has tried and offer lessons applicable to future PES programs.

Each case offers unique insights into specific situations, but there are some aspects that are largely seen across the board. PES schemes seem to all benefit greatly from a strong and broad coalition of groups supporting them from the early planning stages through implementation. PES schemes are still relatively new and people can be resistant to new and different things. Having these coalitions helps to gain trust and respect from communities and partners, which increases the chances of program success. Allowing adequate time is another theme that seems to greatly enhance the chance of success. Creating these partnerships and navigating the new terrain of PES schemes takes time and patience. Many of these cases were only successful because the parties involved were willing to put in up to years of time in order to make it happen. As the cases demonstrate, the benefits of these PES schemes make the time and work put in to make them happen more than completely worth it.

Definitions

Before diving into the cases themselves, we begin with some key definitions. First, as defined by Mercer, Cooley and Hamilton, PES programs are "formal and informal contracts in which landowners are remunerated for managing their land to produce one or more ecosystem services, [and that involve] actual payments between at least one willing buyer and one willing seller to produce or enhance a well-defined ecosystem service or bundle of services (2011, p. 1)." In considering and selecting cases to include here, I have adopted a broad view of what constitutes such key features as remuneration and "actual payment." So, for example, payment might come from a third party, such as a government program, or in the form of in-kind goods and services. On the suppliers' side the service can be in the form of measured benefits or the maintenance of green infrastructure from which ecosystem services flow.

Next, we need to understand what an "ecosystem service" is, and more specifically, where they come from, and what it is that makes an ecosystem service of value to people. By these, we can understand both the basis for a payment and the purpose to which a payment would be put. Ecosystem services are known broadly "benefits people obtain from ecosystems" (Reid et al., 2005; USDA Forest Service, 2012), but Gary Johnson of the University of Vermont, adds some specificity that will make it easier to understand what PES programs accomplish. In his words, ecosystem services are "the effects on human well-being of the flow of benefits from an ecosystem endpoint to a human endpoint at a given extent of space and time (Johnson, 2010)." By this definition, the time and location at which a benefit is delivered is clearly important – a very valuable consideration in PES programs. The definition also makes it clear that ecosystem services are about effects on human well-being, not "nature for nature's sake" or intrinsic values. This, too, is important to keep in mind in considering where PES programs could be helpful and how to design them: one must have a clear idea of which people would benefit and who would pay for the delivery of the benefit.

One final take on "ecosystem services" is provided by Andrew Balmfod and his co-authors, who distinguish between the "ecosystem processes" that result in biophysical goods and services, such as a quantity of water or the appearance of a landscape on the one hand, and "ecosystem benefits," such as drinking water or nature-based recreational experiences on the other (Balmford et al., 2010, 2013). These align nicely with the "ecosystem endpoints" and "human endpoints" of Johnson's definition. Moreover, for PES designers, Balmford clarifies that there is something that delivers value to people by satisfying human needs or wants, and there are biophysical processes that deliver that something. Typically, the sellers in a PES arrangement are taking actions to protect, restore or maintain those processes, whereas the buyers are, naturally, enjoying one or more benefits from those landscape management actions.

Taking cues from these definitions, each PES example below is characterized by the ecosystem process or processes involved on the supply side of the transaction, as well as by the ecosystem benefits delivered to the demand side. Table 1 lists all the possible processes and benefits, along with short definitions and icons that will serve as flags for specific processes and benefits involved in each example.

TABLE 1: ECOSYSTEM PROCESSES AND BENEFITS

Process or Benefit[a]	Definition[a]	Icon[b]
Ecosystem Processes		
Primary Biomass Production	Production of plant biomass, or the accumulation of biomass by organisms that use inorganic sources of energy (i.e., plants) (Mr. G's Environmental Systems)	
Secondary Biomass Production	Accumulation of biomass by animals and other organisms from organic energy sources	
Pollination	Contribution of insects, birds, bats and other organisms to pollen transport resulting in the production of fruit and seeds. May also include seed and fruit dispersal.	
Biological control	Inter- and intra-specific interactions resulting in reduced abundance of species that are pests, vectors of disease, or invasive in a particular ecosystem.	
Other ecological interactions	Other inter- and intra-specific interactions, for example competition and predation, wildland fire, etc.	

Process or Benefit[a]	Definition[a]	Icon[b]
Formation of species habitat	Formation of the physical properties of the habitats necessary for the survival of species (canopy structure in forests, coral reefs).	
Species diversification	The production of genetic diversity ACROSS species.	
Genetic diversification	The production of genetic diversity WITHIN species.	
Waste assimilation	Removal of contaminants from the soil in an ecosystem, including through biological processes such as decomposition or assimilation.	
Soil formation	Process by which soil is created, including changes in soil depth, structure and fertility.	
Erosion regulation	Control of the processes leading to erosion, for example, by controlling the effects of water flow, wind or gravity.	
Formation of physical barriers	Formation of structures that attenuate the energy of (or block) water or wind flow (mangroves, dunes, forests).	
Formation of pleasant scenery	Formation of landscapes that are attractive to people.	
Air quality regulation	Removal of contaminants from air flowing through an ecosystem, including through physical processes (filtration) or biological processes (decomposition or assimilation).	
Regional/local climate regulation	Modulation of regional/local climate (temperature, humidity, wind events).	
Water regulation (timing)	Regulation of the timing of water flow through an ecosystem (attenuation of floods/droughts).	

Process or Benefit[a]	Definition[a]	Icon[b]
Water purification (quality)	Removal of contaminants from water flowing through an ecosystem, including through physical processes (filtration) or biological processes (decomposition or assimilation).	
Water provisioning (quantity)	Changes in the quantity of water flowing through an ecosystem.	
Global climate regulation	Global climate regulation: Modulation of global climate and ocean acidity through changes in the concentration of greenhouse gases in the atmosphere.	
Ecosystem Benefits		
Food:	• Crops, including orchard fruit and nuts, mushrooms, cultivated algae, etc. • Livestock, including poultry • Marine fisheries, both wild/capture fisheries and aquaculture • Inland/Freshwater fisheries, both wild/capture fisheries and aquaculture • Wild animal products, including bush meat, invertebrates, etc. • Wild plants for food, including mushrooms, ramps, etc.	
Freshwater (for direct consumption; excludes irrigation water, covered in crops)	• Drinking water (at the tap, in a bottle, or straight from the spring) • Industrial process water (e.g., paper making, brewing and bottling, food processing, etc.)	
Raw materials	• Crops, such as cotton and flax • Livestock, such as wool and other fiber • Wild plants or animals for fiber, including rattan, hides • Timber both from natural forests and from plantations	

Process or Benefit[a]	Definition[a]	Icon[b]
Energy	• Biofuels from domestic plants • Charcoal/firewood from wild plants • Dung from livestock • Working animals (oxen, llama) • Hydroelectric energy	
Property:	• Preventing loss of property value or condition • Transportation and other infrastructure condition (roads, hospitals, factories)	
Physical health (excluding nutrition, covered under Food)	• From One-time use benefits (synthesis of medicines copied from/inspired by natural products) • Wild medicinal plants • Nature-related outdoor activities that maintaining health and fitness • Avoiding injury and illness from natural hazards, biological agents, pollution, etc.	
Psychological wellbeing	• Crops and Livestock (gardening and interactions with pets, maintenance of rural/farming lifestyle) • Nature-related outdoor activities (hiking, diving, viewing attractive scenery) • From Marine and Inland fisheries and Wild animal products (i.e. watching fish, birds, animals)	
Knowledge	• Nature-related outdoor activities • One-time use benefits (new scientific discoveries, artistic inspiration) • Through education about the natural world.	

Process or Benefit[a]	Definition[a]	Icon[b]
Passive Use Benefits	• Option Value, the value of preserving a component of nature for possibly future use by oneself • Bequest Value, the value of preserving something for future use by others (heirs or unspecified members of a future generation) • Existence Value, the value of simply knowing that something exists and endures in a healthy state absent any expectation of future direct use.	

a. Sources: Phillips (2013), Balmford (2010, 2013).
b. Photo and image credits for icons are listed below on page 35.

CASE 1: COORDINATED SALMON RESTORATION ON PRIVATE LANDS

Location: Methow River Valley, North Central Washington








Ecosystem Processes: Water Regulation (quantity, quality and timing); Secondary biomass production; Formation of species habitat

Ecosystem Benefits: Food; Property; Passive Use Benefit

Salmon Recovery requires the restoration of spawning habitat to improve egg-to-smolt survival. In the Methow River Valley, a partnership between a federal agency, the Federal Bureau of Reclamation (BOR), and a local nonprofit, Methow Salmon Recovery Foundation (MSRF) has been successful in using PES to accomplish this. BOR manages six hundred dams and reservoirs across the U.S. delivering water to municipal and agricultural areas. Recently, BOR has had to extend its reach in order to mitigate the effects of its infrastructure and to help implement the Endangered Species Act (ESA). The BOR is hampered in its ability to work on private lands due to lack of legal authority and lack of landowner trust. This is where The Methow Salmon Recovery Foundation comes in. MSRF was created in order to help farmers comply with ESA in the way that benefits them the most. This partnership has been extremely beneficial because the MSRF has the trust of local landowners that enables the implementation of BOR's goals. Together these institutions comprise the buyer of the ecosystem service of salmon habitat.

BOR and MSRF work together to identify, plan, design, and permit projects to help salmon on private lands. For instance they will install irrigation diversion dams with structures that allow fish passage or restore salmon habitat. Once problems have been assessed and possible fixes have been prioritized, MSRF reaches out to individual local landowners and holds face-to-face meetings with them. This step identifies interested landowners that will be partners, ecosystem service providers, in the PES scheme. MSRF and BOR work together to seek funding from institutions like Bonneville Power Administration or the Upper Columbia Salmon Recovery Board that have interests in maintaining salmon habitat.

This system utilizes a combination of funds from federal appropriations and legal settlements for dam mitigation in order to encourage local landowners to improve waterways for salmon. This is an example of a public payment scheme for private landowners, in that BOR and other government groups fund many of the projects facilitated by a private group, MSRF, which attains the trust of landowners. Landowners also get the benefits of increased property values and increased irrigation efficiencies, which result in cost savings that are key to attracting participants. Fifty out of eighty landowners on a stretch of river between the towns of Winthrop and Twisp have met with MSRF, demonstrating the success of the outreach for partners. As of summer 2011, twenty out of this group are moving forward with projects. Since the 1990s salmon runs have improved likely due to the new salmon territory that these projects have opened up ("Coordinated Salmon Habitat Restoration on Private Lands," 2013). In 2010, it was considered a good year when 5,500 naturally spawning salmon and steelhead appeared in the Methow River (Torvik, 2014).The success of this PES scheme can be largely attributed to the trust between MSRF and local landowners as well as to the personal benefits that local landowners receive.

Contacts:

Chris Johnson, MSRF President: (509)-429-1232, chrisj@methowsalmon.org

Program Website: http://www.methowsalmon.org/.

CASE 2: NEW YORK CITY'S WATERSHED

Location: Catskill-Delaware Watershed








Ecosystem Processes: Water Regulation (quality); Formation of Species Habitat; Waste Assimilation; Formation of Pleasant Scenery

Ecosystem Benefits: Food; Freshwater; Physical Health; Psychological Wellbeing; Property

New York City (NYC) has taken a unique approach to keeping its drinking water clean. The U.S. Safe Drinking Water Act says that drinking water providers must filter their water unless they can prove that their natural water system's process and natural conditions provide safe water and that they are proactively protecting their watersheds in such a way that water quality standards will continue to be met (US EPA, Office of Water, 1996). Most U.S. cities have chosen to filter their water, but NYC is the largest city in the U.S. to choose watershed protection instead of a filtration plant. After years of negotiation NYC signed a memorandum of agreement (MOA) in 1997 that set up the watershed protection plan. This set NYC up as the buyer of the ecosystem service of water quality from many sellers, 70 towns and villages in the Catskill-Delaware watershed, which provides 90% of NYC's drinking water. The MOA committed NYC to investing $1.5 billion over 10 years to restore and protect the watershed and to improve the local economies and quality of life of watershed residents. In the first 5 years NYC solicited sales for 258,719 acres and signed 477 purchase contracts for 34,446 acres for a total purchase price of about $94 million, which about doubled the area of protected buffer land surrounding the 8 reservoirs in the Catskill-Delaware watershed (Postel & Thompson, 2005). Funding is public, taken from additional taxes on residents' water bills and from bonds issued by the city. Compared to the estimated cost of a filtration plant, $6 billion in capital costs, then $300 million in annual operation and maintenance costs, this was an extremely good deal, and residents' water costs are still lower than they would be if a filtration plant were built.

There can often be a disconnect between those who bear the costs of watershed protection and those who reap the benefits, so this represents a perfect situation for a PES connection to be made. The beneficiaries are widespread including water suppliers, hydroelectric power producers, water users downstream, and residents of NYC who benefit from reduced water costs. Residents in the watershed also benefit in many ways. They receive the benefits from improved fishing and water quality. 6,919 ac of NYC's newly acquired land have been opened for public recreational uses like fishing, hunting, and hiking, which improve the quality of life for residents. NYC has also established a $60 million dollar trust fund that provides loans and grants for environmentally sustainable economic development projects in the watershed communities, which promotes economic development for these areas while making sure it is consistent with water quality protection.

This program has been hugely successful. After the first five years there was enough proof of watershed protection and improvement for the EPA to waive the filtration requirement for NYC. Most recently by submitting its "Long Term Watershed Protection Plan" in 2007, NYC received a 10-year Filtration Avoidance Determination (FAD) from the EPA that runs from 2007-2017 ("Regulatory Background," n.d.). This may become more difficult as the

population and economy grows in the watershed region and federal water quality standards become stricter. However, NYC has set itself up for success by forming broad partnerships with state and federal agencies, environmental groups, and partners in the watershed that can better reach local populations to implement program goals.

Contact: Barton H. Thompson Jr.: buzzt@stanford.edu, 650-723-2518

NYC Department of Environmental Protection: 212-639-9675

Program Website: http://www.nyc.gov/html/dep/html/watershed_protection/index.shtml

CASE 3: PRICKLY PEAR CREEK

Location: Montana, between East Helena and Lake Helena

Ecosystem Processes: Water Regulation (quantity and timing); Formation of Species Habitat

Ecosystem Benefits: Freshwater; Property

Tens of thousands of miles of streams in the U.S. are now dewatered. In Montana alone there are 4,000 miles of dewatered creeks. This trend is a serious one that threatens many ecosystem functions. The case of Prickly Pear Creek shows a huge success that can be copied to help alleviate this problem elsewhere as well.

Montana struggles to keep streams flowing because of a poorly crafted legal right, senior water rights. Senior water rights give the rights to water in streams to those who were there first. However, if these people don't use their water rights by diverting water from the streams, they run the risk of losing their water rights along with the economic value that is attached to it. This has led to the overdrawing of streams until many streams like Prickly Pear Creek run dry. In Prickly Pear Creek's case it has run dry for over 100 years in the summer. Now, a PES solution has been tested that has returned water to the creek.

Breweries in Montana, as well as other companies around the U.S. and world care about their water footprint because of concerns about supply and efficiency and how it affects their brand image. Brewing is very water intensive: a single pint takes about 5 pints of water to make, and if you count the water that goes into grain production, the water cost of a pint of beer jumps to 100 pints (Harmon, 2010). Breweries in Montana who care about their water footprint, and who know that their costumers care about their water footprint are a group extremely interested in being buyers of water provisioning. Working through local water trusts, breweries have been linked with private citizens who hold senior water rights and are sellers of this ecosystem service. The private senior water rights holders close the diversions they use to extract water from the stream. The amount of water that is left in the stream is measured and divided into thousand gallon increments, which are given a serial number. Brewers can then buy this water as a certificate and the payment goes to the private senior water rights holders. This creates an incentive for private water rights holders to leave their water rights in the stream. It is extremely beneficial to them because they get to receive payment to keep their water rights but leave the water in the stream protected from other users. It also pumps economic activity into rural economies. This benefits businesses that care about their water footprint by giving them a clear way to manage it.

Prickly Pear Creek, before and after flow restoration.
Photo: Clark Fork Coalition

This PES scheme using private funding has been highly successful, returning 4 billion gallons of water to degraded ecosystems. This has allowed Prickly Pear Creek to maintain connectivity throughout irrigation season, something that has not been possible in many years, and supports about 2 river miles of additional usable habitat ("Prickly Pear Creek," n.d.). The buyers from Prickly Pear Creek have been expanded to include hotels and tea companies in Oregon as well as water guzzling hi-tech companies in the southwest.

Contact:

Clark Fork Coalition: (406)-542-0539, info@clarkfork.org

Bonneville Environmental Foundation: (503)-248-1905, info@b-e-f.org

Program Website:

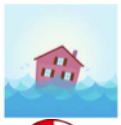
http://www.clarkfork.org/stream-renewal-initiative/prickly-pear-creek.html

http://www.b-e-f.org/project-portfolio/prickly-pear-creek/

CASE 4: DISPERSED WATER MANAGEMENT PROGRAM NOTHERN EVERGLADES

Location: Lake Okeechobee Area, Florida








Ecosystem Processes: Primary Biomass Production; Formation of Species Habitat; Formation of Physical Barriers; Water Regulation (quantity, quality and timing); Waste Assimilation

Ecosystem Benefits: Property

Lake Okeechobee has experienced excess water levels, which has had detrimental effects such as flooding and with it the loss of crop production, damage to houses and other costs. Beginning in 2005 the Dispersed Water Management Program created collaboration between agencies, environmental organizations, ranchers, and researchers, to attack this problem using a PES scheme.

This program uses public funding from agencies such as the Florida Department of Environmental Protection, South Florida Water Management District, and Florida Department of Agriculture and Consumer Services. These agencies make up the buyers who create partnerships with local ranchers and landowners, the sellers, in order to help store excess water on their private property. Storing water upstream will help prevent overfilling Lake Okeechobee and potential discharges into surrounding estuaries such as St. Lucie and Caloosahatchee. In October 2011, 8 pilot projects were run to see how well a PES scheme might work in this situation. These pilot projects were extremely successful with one removing 8.4 metric tons of phosphorus in one year (Smith, 2011). This success has fueled the initiation of more projects. In November 2011, 8 new contracts with ranchers were added to the project. The District will invest $7 million over 10 years for this round of contracts. In addition $46 million has been designated for the next five years to help reach program goals. These new contracts provide many benefits. They will provide 4,800 acre-feet of regional storage and additional nutrient benefits, such as preventing phosphorus from reaching Lake Okeechobee. This also creates additional security from flooding for surrounding communities. The ranches storing the water will support local plants and wildlife by rehydrating the land. Additionally this program has reduced costs from traditional government land acquisition programs that would burden taxpayers with new debt needed to buy the land. It also keeps the ranch lands on local tax rolls. Together these factors help sustain the local economy and ranching jobs.

This program has used about 229,000 acres of land for water storage, water quality improvement, and habitat enhancement. As of July 2014 it has provided 164,400 acre-feet of water retention/storage, but its end goal is to provide 450,000 acre-feet of retention/storage throughout the Northern Everglades watershed ("Dispersed Water Management Program," 2014). This would mean a foot of water off of all of Lake Okeechobee. This program has been successful for many reasons, but of particular importance has been that the program benefits all partners, and it involves a wide base of stakeholders, including the United States Department of Agriculture's Natural Resources Conservation Service and World Wildlife Fund in addition to the many partners mentioned earlier.

Contact: Randy Smith (South Florida Water Management District): Office: (561)-682-2800, Cell (561)-389-3386

Damon Meiers (South Florida Water Management District): dmeiers@sfwmd.gov, (561)-682-6876

Project Website:
http://www.sfwmd.gov/portal/page/portal/xweb%20protecting%20and%20restoring/water%20storage%20programs?utm_source=jtf&utm_medium=pdf&utm_campaign=waterstorage

CASE 5: DENVER FORESTS TO FAUCETS PARTNERSHIP

Location: Denver City, surrounding Denver County, and Middle South Platte-Cherry Creek Watershed








Ecosystem Processes: Biological Control; Water Regulation (quality); Formation of Species Habitat; Formation of Pleasant Scenery

Ecosystem Benefits: Freshwater; Raw Materials; Energy; Property

Colorado experienced the largest fire in its history beginning on June 8, 2002 and continuing for 20 days. It burned 138,000 acres, caused $40 million in firefighting costs, destroyed 132 homes, and killed 6 people (Adams, n.d.). This fire was exceptional because of the surrounding circumstances; it was extremely dry, there was the perfect wind to spread it, and dense forest was filled with susceptible trees. One of the worst effects of this fire was its impact on Denver's drinking water. After the fire, the United States Forest Service spent $37 million in restoration and stabilization projects for the burned over lands, but heavy rains still pushed over 1 million cubic yards of sediment into nearby Strontia Springs Reservoir. This resulted in over $10 million in costs to Denver Water for water quality treatment, sediment and debris removal, reclamation techniques, and infrastructure projects.

As a result of this tragic fire and the extreme costs that followed it, Denver Water formed a partnership with the U.S. Forest Service in order to proactively try to improve the quantity and quality of water used by the city and county of Denver. To do this they targeted improving forest health to reduce wildfire risks, which would both prevent costly impacts to the water collection system and avert future costs of fires in terms of life and safety, property loss and, of course, firefighting itself. In August 2010 Denver Water and the U.S. Forest Service entered into a contract that obligated Denver Water to match the Forest Service's contribution of $16.5 million which will be used over five years to administer and oversee restoration activities, including forest thinning and fuel reduction projects.

This project is an example of funding through a public federal- local partnership. The 38,000 acres of forest that will be treated belong to the American people and are managed by the U.S. Forest Service. By providing matching funds ultimately provided by ratepayers, Denver Water will secure the benefits of improved ecosystem process for its residential, commercial and industrial customers. Taking this approach cuts the possibility of later costs from wildfires to Denver Water that would be paid by water users in the form of higher water rates and new tap fees.

Using an assessment from a collaborative effort of state and federal agencies, "Zones of Concern", areas that are at the highest risk, can be targeted. Denver Water will benefit from lower future costs to remediate streams contaminated after wildfires, and the chance of wildfire will be reduced for at-risk communities. In addition there are likely to be improvements to other ecological processes (and their associated benefits). These include formation of pleasant scenery in a region where an episodic and larger-than-normal bark beetle epidemic has blighted the forest with dead and dying trees, and by improving forest

health and reducing the erosion that had caused trouble for Denver Water, the measures will also improve habitat for fish and wildlife species.

Contact: Steve Adams: sadams@iscvt.org

Project Website:
http://www.denverwater.org/supplyplanning/watersupply/partnershipuSFS/

CASE 6: KANSAS WALK IN HUNTING ACCESS

Location: Kansas







Ecosystem Processes: Other Ecological Interactions (Human Interaction via Hunting)

Ecosystem Benefits: Food; Raw Materials; Property; Physical Health; Psychological Wellbeing; Passive Use Benefits

In 1995, the Kansas Department of Wildlife, Parks, and Tourism launched the Kansas Walk in Hunting Access Program (WIHA). This program allows public hunting access on private property throughout the state of Kansas through lease agreements between the Kansas Department of Wildlife, Parks, and Tourism and Kansas Landowners. The Kansas Department of Wildlife, Parks, and Tourism is the buyer of the ecosystem service, nature recreation providing multiple benefits. Kansas's landowners are the sellers.

Landowners get a small payment based on the number of acres they enroll, the quality of the habitat, and the length of the contract. Payments can range from $150 to $4,050 (per acre), depending on these aspects of the land ("WIHA Temporary Brochure: Public Hunting Access & Your Land," n.d.). The program is flexible allowing landowners to choose the length of their contract, which can run from September or November 1st to January 31st, or, for spring turkey, from April 1st to May 31st ("KDWP Offers Landowners Contracts for Walk-In Hunting Access," 2009). Landowners can also choose whether their contracts will be annually renewable or multi-year contracts. They retain the right to withdraw at any time. With such a flexible set up, this program offers many benefits to landowners. The land remains private, but the Kansas Department of Wildlife, Parks, and Tourism will post signs to mark safety zones or areas requested by landowners to be off limits to hunting, and the Department will regularly patrol the areas. This is a great benefit to many landowners who are unable to monitor hunting access. Indeed, much of the enrolled land might be hunted on even if its owner had not enrolled in the program. State law also waives liability from private individuals who lease land to the state for recreational purposes and gives them immunity from damages or injuries resulting from ordinary negligence, thus removing another barrier to the delivery of important ecosystem benefits.

This program is beneficial to the Kansas Department of Wildlife, Parks, and Tourism because it is able to meet one of its goals of maintaining the rich hunting history of Kansas through a means that is less expensive than fee acquisition of more land for public use. By 2008 over 1 million acres were enrolled in this program with almost 3000 contracts. The majority of the acres provide upland bird hunting, but some of the land also has chances for deer, waterfowl, and squirrel. There was a new record set in spring 2014 with almost 214,000 acres open for turkey hunting ("Kansas opens more than 200,000 acres for Walk-In Hunting Access program," 2014). This public private partnership has been successful in great part because of its flexibility and clear benefits to a large population of Kansas residents who care about hunting.

Contact: Kansas Department of Wildlife, Parks and Tourism Operations: Office 512 SE 25th Ave., Pratt, KS 67124; (620) 672-5911

Program Website: http://kdwpt.state.ks.us/news/Services/Private-Landowner-Assistance/Wildlife/Walk-in-Hunting

CASE 7: GO ZERO

Location: Upper Ouachita National Wildlife Refuge









Ecosystem Processes: Primary Biomass Production; Formation of Species Habitat; Formation of Physical Barriers; Regional/Local Climate Regulation; Water Regulation (timing); Air Quality Regulation; Global Climate Regulation

Ecosystem Benefits: Property; Physical Health; Psychological Wellbeing; Knowledge; Passive Use Benefits

The Ouachita River winds through Louisiana for over 600 miles, with the northernmost section in the state surrounded by the Upper Ouachita National Wildlife Refuge. The refuge encompasses 42,500 acres between the Arkansas-Louisiana border and ending about 20 miles north of Monroe, LA. The Upper Ouachita National Wildlife Refuge was established in 1978 to preserve wetlands and homes for migratory birds. This was a response to habitat loss that occurred in the 1960s as hardwood forests surrounding the river were converted to cropland as food prices began to skyrocket. This trend has led to vastly opposite landscapes; on the west side of the river is dense native northern Louisiana trees, but to the east are farm fields.

Go Zero, a group that works to "address climate change and habitat loss by protecting and restoring America's forests", is working in the Upper Ouachita National Wildlife Refuge to reforest farm fields by planting native oak, pecan, and hickory trees ("Go Zero Brochure," n.d.). Go Zero works as a seller of the ecosystem services provided as a result of forest restoration. Any company or individual can be a buyer of this service. The transaction begins with a donation to Go Zero who then plants trees on private lands and within the Upper Ouachita National Wildlife Refuge itself. In addition to improving habitat for many wildlife species, tree planting also generates carbon credits. Go Zero can then sell these credits to companies that are trying to meet voluntary or regulatory reductions in their carbon footprint.


Upper Ouachita River in the Mollicy Farm Unit.
Photo: U.S. Fish & Wildlife Service.

Go Zero can also sell carbon credits to other institutions, such as universities, or individuals who, for ethical reasons, want to offset the carbon emissions of their operations or personal lives, or to anyone who simply cares about promoting carbon sequestration may also donate to generate carbon credits. Once such credits are bought they are retired, or withheld from the carbon market entirely. Because they cannot subsequently be sold as emission offsets, these transactions result in a net decrease in carbon emissions.

In total Go Zero has protected 73,000 acres of working forest, restored 25,000 acres of forestland, and planted 10 million trees on private land. In addition, the project planted more than one million trees and restored 26,000 acres on the Upper Ouachita National

Wildlife Refuge by the end of 2012. However, they were not done. The goal for 2013 was to restore another 400 acres.

This success brings many benefits. The 10 million trees planted since 2000 will result in the permanent sequestration of an estimated 10 million tons of carbon over the next 100 years ("Carbon Highlights," n.d.). The reforestation and restoration creates and improves habitat for deer, turkey, alligator, bald eagle, threatened Louisiana black bear, as well as 265 species of migratory birds. It also improves the water quality for downstream communities including Monroe and West Monroe. The economy benefits as well because tree planting creates jobs and reduces the impacts of flooding for farmers. It provides recreation opportunities for visitors who can hike, fish, bird watch, hunt, and learn about nature on many of the tracts. Companies and individuals who purchase carbon credits also benefit by having a cost-effective means of reducing their overall carbon footprint. All of these benefits are possible because of the funding by Go Zero's donors and public support via the U.S. Fish and Wildlife Service.

Contact: Alterra Hetzel: Arlington, VA; (571) 251- 8293; ahetzel@conservationfund.org

Project Website: http://www.conservationfund.org/projects/gozero-carbon-projects-upper-ouachita-national-wildlife-refuge/

CASE 8: THE BAY BANK: THE CHESAPEAKE'S CONSERVATION MARKETPLACE

Location: Chesapeake Bay and Surrounding Area











Ecosystem Processes: Primary Biomass Production; Secondary Biomass Production; Formation of Species Habitat; Formation of Pleasant Scenery; Regional/Local Climate Regulation; Air Quality Regulation; Water Regulation (quality)

Ecosystem Benefits: Freshwater; Property; Knowledge; Passive Use Benefits

There are many emerging markets for ecosystem services, but making these successful requires perfection of many moving parts. In economic parlance, one would say that the market for ecosystem services is hindered by high "transactions costs" – the cost of gaining information about the goods sold, the cost of establishing contracts for their provision, and the cost of enforcing resulting agreements to provide them. This is where Bay Bank has come in to fill the void. Bay Bank was developed by the Pinchot Institute for Conservation and Sustainable Solutions LLC at the request of the Chesapeake Bay Executive Council[1] (Sprague, 2010). The Bay Bank is an online resource that helps landowners overcome the obstacles to becoming sellers of ecosystem services such as high costs of participation and lack of awareness. It also provides a service to buyers of ecosystem services by connecting them with these sellers. The main focus of the Bay Bank currently is on the ecosystem services of forest conservation, habitat conservation, carbon sequestration, conservation programs, and water quality.

Bay Bank makes these connections starting with market education and outreach. Any landowner who wishes to be a seller of ecosystem services can use Bay Bank's tool called Landserver, which evaluates natural resources and the potential of property to receive payments for implementing conservation actions. Bay Bank uses multitudes of partnerships in order to provide its services. For example the information for Landserver is accumulated and constantly updated from regional geospatial datasets provided by state agencies, conservation groups, and other partners in order to be as accurate as possible. With the Landserver analysis, Bay Bank evaluates the potential of landowners to enroll in valuable state and federal cost share programs. Governments, conservation organizations, foundations and other groups all post cost share programs on Bay Bank's website, and Bay Bank helps them find eligible landowners to partner with. Landowners can partner up with buyers at one of three points. Landowners can list on the site an expression of interest, a verified opportunity (the land has been evaluated as eligible for a conservation action), or a certified credit (the landowner has taken a conservation action and is looking for a buyer of their credit). Bay Bank uses these verifications to create transparency and make sellers and buyers more certain about their prospects and projects. Bay Bank helps sellers to actually implement conservation actions by providing a list of certified technical service providers who can help them develop their projects.

[1] The Council is made up of the six Bay states' governments (Maryland, Delaware, Virginia, West Virginia, Pennsylvania, and New York), the U.S. EPA Administrator, and the Chesapeake Bay Commission.

Bay Bank has created an extremely important link between sellers and buyers of valuable ecosystem services that can help to advance payment for ecosystem service schemes at many levels. With this existing framework it is easier for new sellers to enter the market, and it also encourages new buyers to enter the market and utilize an accessible, easy way to achieve their ecosystem service goals.

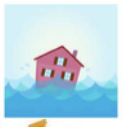
Contact: Eric Sprague: esprague@pinchot.org

Project Website: http://www.thebaybank.org

CASE 9: NAPA FLOOD PLAIN RESTORATION

Location: Napa California





Ecosystem Processes: Formation of Species Habitat; Formation of Pleasant Scenery; Water Regulation (quantity and timing)

Ecosystem Benefits: Property; Physical Health; Psychological Wellbeing; Knowledge

Floods are by far the most common natural disaster seen today. In the U.S. alonefloods take dozens of lives and cost $4 billion in damages in an average year. In Napa, California floods have been especially destructive. In the Napa valley alone, there were 28 major floods and over $500 million in damages documented since 1862. Finally, in the 1990s the residents of Napa proposed a new way to deal with these floods that could reduce these catastrophic costs.

Residents proposed using a living river approach that follows the ecosystem services framework, which focuses on "the long-term role that healthy ecosystems play in the sustainable provision of human wellbeing, economic development, and poverty alleviation across the globe" (Turner & Daily, 2008). A living river approach meant moving nine bridges and over 100 buildings and restoring almost 620 acres of floodplain. Replacing the bridges removed obstacles that could be damaged by high flows, and terracing riverbanks reconnected the river to its historic floodplain. Easements and acquisitions were also used to remove especially vulnerable structures from harm's way. In this case the government used public funds to buy land and buildings from private citizens to avert costs of flooding that might still occur.

The living river approach was proposed instead of the typical physical capital (or "grey infrastructure") approach that would have used a deep straight channel requiring yearly dredging and tall floodwalls. The living river approach was estimated to cost $400 million, more than the cost of the physical capital approach, and residents would have to fund half of this through a 1% increase in sales tax for 20 years (Almack, 2010). The other half of the funding would come from the budget of the federal U.S. Army Corps and state grants and loans. Residents knew that they would have to pay for part of the living river approach, but they still supported it, in part because of the ecological co-benefits that would result.

The residents have not been disappointed, as the project has generated numerous benefits and has paid off by reinvigorating the town with its countless benefits. For example there is increased flood control, restoration of fish and wildlife habitat, and restoration of scenic beauty. The project has also attracted additional recreation, tourism, and commerce. The quality of life in Napa has improved with boating, hiking, and other amenities now realized that had been ignored back when the river was seen as an enemy needing to be constantly fought. The City of Napa's Economic Development Office has confirmed that there was a huge increase in private investment after the flood plan was approved; there was $193 million in private construction from 1999 to 2005 alone (Turner & Daily, 2008).

The flood plan mitigates flooding over 6 miles of the 55-mile long Napa River and an additional 1-mile of the Napa Creek, a tributary that flows through the town. The completed

project will protect 7,000 people and 3,000 residential/commercial units from disastrous flooding. The local effort has proven to have many benefits. Now, similar flood management efforts are needed upstream in order to solidify the long-term success of the project.

Contact: Phillip Miller (Napa District Engineer): (707)-259-860

Project Website:
http://www.countyofnapa.org/Pages/DepartmentContent.aspx?id=4294971816

CASE 10: CONSERVATION RESERVE PROGRAM

Location: Farmland Across the United States









Ecosystem Processes: Primary Biomass Production; Secondary Biomass Production; Formation of Species Habitat; Erosion Regulation; Formation of Pleasant Scenery; Water Regulation (quality)

Ecosystem Benefits: Freshwater; Knowledge; Passive Use Benefits

The United States Department of Agriculture (USDA) began the Conservation Reserve Program (CRP) in 1986. The purpose is to take degraded, highly erodible, or environmentally sensitive pasture or cropland out of use in order for it to be restored. The USDA is the buyer in this situation from farmers across the United States who are sellers. They commit their land to be out of agricultural use usually for 10 to 15 years. The land is managed for conservation by planting cover crops or trees to prevent erosion and runoff during the time that it is out of agricultural use. This is a public private partnership that uses public funding in the form of taxes.

Since its start in 1986 the program has temporarily retired over 34 million acres of environmentally sensitive and highly erodible cropland. It has also diverted tens of millions of other acres out of active use and into conservation. This has led to large improvements in water quality due to reductions in nutrient and sediment run-off. Researchers estimate that CRP reduces soil erosion by 750 million tons per year, which results in millions of dollars in economic benefits to farmers and to downstream communities (Dlugolecki, 2012). It has also benefited wildlife habitat and recreation in the form of improved wildlife viewing. In 2001 the total wildlife benefits from this program in the US were estimated at $737 million.

As just one example, Oklahoma has seen great benefits from the CRP. In 2008 there were $39.2 million in direct payments distributed to farmers and ranchers from government compensation. Economists found that this had an estimated impact of an additional $0.46 on every dollar amounting to an impact of $57.2 million dollars throughout the state for that year. This revenue is often spent in the local economy to pay the salaries of conservation employees or buy materials for the projects, which is an added benefit.

To date, CRP has taken primarily a reactive, restorative approach by trying to restore land once it is already degraded. However, it is now moving toward some more preventative measures. For example in 2012 CRP added 20,000 acres specifically to benefit the health of the Chesapeake Bay watershed. In agricultural states the CRP is crucial to protecting intact prairie and grassland habitat. The Government Accountability Office estimated that an average plan to recover threatened or endangered species costs $15.9 million, so the CRP can play an important role in offsetting these costs.

This program has been running successfully for almost thirty years and continues to add land into conservation. The economic incentives are hugely important for this project especially in rural areas that are very sensitive to the need for additional income. The downside to this program is that long-term government compensation programs are difficult to

promise continued funding as they could always lose political favor. However, the CRP has shown a valuable example of a working PES scheme that may be emulated in many ways.

Contact: Laura Dlugolecki: Dlugolecki.Laura@epa.gov

Program Website:
http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp

CASE 11: COLORADO HABITAT EXCHANGE

Location: Colorado






Ecosystem Processes: Primary Biomass Production; Secondary Biomass Production; Formation of Species Habitat

Ecosystem Benefits: Psychological Wellbeing; Knowledge; Passive Use Benefits

The Colorado Habitat Exchange is a brand new program that is still being developed, but holds great potential. Its goals are to protect sage grouse habitat by conserving and restoring sagebrush ecosystems. Using a credit system they seek to match volunteer sellers with interested buyers. This is an example of a PES scheme that can have any combination of private or public components.

The Colorado Habitat Exchange is led by a diverse Working Group with representatives from the Environmental Defense Fund, Colorado Department of Natural Resources, Colorado Cattlemen's Association, Colorado Parks and Wildlife, Partners for Western Conservation, and Colorado Oil and Gas Association ("Colorado Habitat Exchange-Executive Summary," n.d.). The Exchange includes all of these parties in order to have the greatest chance of protecting sage grouse habitat while not interfering with Colorado's economic activity and culture including energy development and agriculture. The Exchange uses the habitat quantification tool, which determines the value of a sellers land as sage grouse habitat, which they get credits for, and a buyers debits, which are due to negative human impact and they need credits to offset these. The exchange then verifies and oversees the trading of these credits.

The Exchange is doing a pilot program currently, Summer 2014. They have set themselves up for success with an oversight committee with representatives from federal and state regulatory agencies as well as environmental interests. They also have researchers on board to make sure they create matches between buyers and sellers that have the greatest positive impact possible. Lastly they have verifiers that will check on their activity to make sure everything is transparent, efficient, and benefiting the overarching goal of protecting sage grouse habitat. All of this infrastructure should create regulatory certainty for industries with a competent market infrastructure that has the tools to facilitate PES. With so many interests involved, the Colorado Habitat Exchange has a very good chance of being a successful PES scheme.

Contact: Don Carr: (202)-572-3245, dcarr@edf.org

Project Website: http://www.thehabitatexchange.org/

CASE 12: LENTS FLOOD PLAIN RESTORATION

Location: Portland, Oregon













Ecosystem Processes: Primary Biomass Production; Secondary Biomass Production; Formation of Species Habitat; Formation of Pleasant Scenery; Water Regulation (quantity, quality and timing)

Ecosystem Benefits: Freshwater; Property; Physical Health; Psychological Health; Knowledge; Passive Use Benefits

The City of Portland faced a problem area for years; a section of Foster Road in the city flooded about every other year when there were heavy rains. When this occurred, there was significant damage: local businesses close, and ecosystems are disrupted. Portland decided to put in the time and effort to restore this area and reduce the risk of flooding.

Working for over 15 years through the Willing Seller Acquisition Program, the City of Portland bought the land at highest risk of floods in the area from 60 families and helped them move out ("Natural Area Information," n.d.). The Willing Seller Acquisition Program was developed in 1997 by Environmental Services of Portland and offers willing sellers fair market value for their property ("Willing Seller Program," n.d.). The City then places deed restrictions on purchased properties that designate them as open space in perpetuity. This land subsequently became the site of the Lents Flood Plain Restoration. An additional $2.7 million in funding for the project came from the Federal Emergency Management Agency's Pre-Disaster Mitigation Grant Program and other funding came from federal community block grants and Portland stormwater funds. This PES scheme used a variety of public funding mechanisms to purchase and restore private land that could provide the ecosystem service of stormwater management.

The restoration of the 63-acre site was completed in 2012. It added 140 acre-feet of flood storage, which is enough to cover the entire site with about one and a half feet of water. Apart from reducing the flood risks, there are many other benefits. Over a half-mile of native salmon including threatened Coho and Chinook salmon, trout and, lamprey habitat was restored in Johnson Creek. Enhancements to two ponds on the site benefit sensitive red-legged frogs and Northwestern salamanders. Plantings of over 20,000 native trees and over 70,000 native shrubs benefit ground-nesting birds like killdeer and small mammals like rabbits and skunk. Deer, coyote, hawks, and bald eagles all also visit the restored site. Water quality of Johnson Creek has improved because sediments in high water are able to settle on the floodplain. The site has created many neighborhood improvements as well. There is now a publicly accessible natural area in east Portland with an ADA accessible trail and pedestrian bridge for viewing Johnson Creek and wildlife. A new parking area also serves as a trailhead for the Springwater Corridor Trail.

This project has been a great success. Overall the flooding risk was reduced by about one third and the area that once flooded every other year will likely only flood once every 6 to 8 years. In January 2012 this was put to the test when Johnson Creek rose to more than 2

feet above historic flood stage and the site filled with water. The site held all of the water, Foster Road did not flood, and local businesses were able to stay open.

Contact: City of Portland Environmental Services: 503-823-7740

Project Website: https://www.portlandoregon.gov/bes/62005

CASE 13: SUSTAINING THE WATERSHED

Location: Santa Fe, New Mexico

Ecosystem Processes: Water Regulation (quality)

Ecosystem Benefits: Freshwater; Property; Psychological Wellbeing; Knowledge

Over one third of Santa Fe's 80,000 residents get their municipal water supply from the Santa Fe River. Most of the watershed flows through the quite unpolluted Santa Fe National Forest including 10,000 acres within the Pecos Wilderness Area. Although this seems like an optimal watershed site, a series of large-scale wildfires that have hit the region's ponderosa pine forests have created a major threat to the water supply. After one of these wildfires, the 48,000-acre Cerro Grande fire in northern New Mexico in 2000 that caused $17 million in damage from sediment and debris to the water supply delivery infrastructure of Los Alamos, officials in Santa Fe began seriously looking for ways to protect the Santa Fe River watershed ("Healthy Headwater's Success Story: Santa Fe, New Mexico - Sustaining the Watershed," n.d.).

The City quickly secured a $7 million congressional earmark to pay for an initial phase of forest thinning projects near the city's two reservoirs on federal lands between 2003 and 2006. This phase, however, was only the beginning of what was clearly a much bigger project that would need a much more stable source of funding than federal earmarks. The estimated cost of a comprehensive watershed management plan was $5.1 million over 20 years. Although this is a hefty price tag, it is comparatively small relative to the risks: it is just one fifth the amount of the estimated water-related costs that would result from a 10,000-acre fire. Laura McCarthy, working for the Nature Conservancy and inspired by a successful PES scheme to fund watershed restoration and protection of water supplies in Ecuador, took four years to create a coalition with partners from the Santa Fe Fire Department, the Water Division, the non-profit Santa Fe Watershed Association, and officials from all levels of the Forest Service. This group published the final Santa Fe Municipal Watershed Plan in 2009, which included a proposal to raise about $200,000 dollars annually for the water fund through a ratepayer contribution program. The program would charge only about 54 cents per month for the average household. With relatively high water rates compared to other western cities already, it was a pleasant surprise that a March 2011 poll by the Nature Conservancy and the Watershed Association found that 82% of ratepayers were willing to pay a charge of 65 cents per month to protect the City's water supply from the risk of catastrophic wildfire.

This poll result demonstrates the success of the coalition to gain support in Santa Fe based off the immense benefits that watershed protection will have for the city. A grant from the New Mexico Water Trust that funds the first three years of the watershed plan has allowed the city to postpone the rate increase. Instead, they are using this as an education opportunity. By listing the charge on users' water bills as a credit with a note about the purpose of the expenditures, residents have the opportunity to become more informed about the watershed program, which will likely increase support even further before the rates actually rise. Beginning in 2013 the program will actually be financed by the ratepayers.

Since 2002, the fuel load has been reduced on over 5,500 acres of forest and forest density has been returned to natural fire regime levels, meaning reducing trees per acre from over 1,000 to 20-50.

Contact: Laura McCarthy: lmccarthy@tnc.org

Project Website: http://www.santafenm.gov/municipal_watershed_investment_plan

PHOTO AND IMAGE CREDITS

Cover Photo: Jacks River, Cohutta Wilderness, Chattahoochee National Forest, Spencer Phillips.

Peaceable Kingdom (icon for species diversity): Edward Hicks (1826), National Gallery of Art, Washington, DC, (open access) retrieved from http://www.nga.gov/content/ngaweb/Collection/art-object-page.59908.html.

Prickly Pear Creek Photos courtesy of Clark Fork Coalition, Missoula, Montana. Retrieved from http://www.clarkfork.org/stream-renewal-initiative/prickly-pear-creek.html.

Upper Ouachita National Wildlife Refuge Photo retrieved from http://www.conservationfund.org/projects/upper-ouachita-national-wildlife-refuge/.

WORKS CITED

Adams, S. (n.d.). From Forests to Faucets Partnership: Denver Water and the United States Forest Service. Institute for Sustainable Communities. Retrieved from http://sustainablecommunitiesleadershipacademy.org/resource_files/documents/denver-forests-to-faucets-partnership.pdf

Almack, K. (2010, December). Restoring Ecosystem Services to Prevent Flood Damage in Napa River Basin. Retrieved from http://www.teebweb.org/wp-content/uploads/2013/01/River-restoration-to-avoid-flood-damage-USA.pdf

Balmford, A., Fisher, B., Green, R. E., Naidoo, R., Strassburg, B., Kerry Turner, R., & Rodrigues, A. S. L. (2010). Bringing Ecosystem Services into the Real World: An Operational Framework for Assessing the Economic Consequences of Losing Wild Nature. *Environmental and Resource Economics*, *48*(2), 161–175. doi:10.1007/s10640-010-9413-2

Balmford, A., Rodrigues, A., Walpole, M., Brink, P., Kettunen, M., de Groot, R., & Cambridge, U. (2013). *The Economics of Biodiversity and Ecosystems: Scoping the Science*. (Vol. 8 SRC - GoogleScholar). Retrieved from http://ec.europa.eu/environment/nature/biodiversity/economics/teeb_en.htm

Carbon Highlights. (n.d.). The Conservation Fund. Retrieved from http://www.conservationfund.org/our-conservation-strategy/major-programs/go-zero/

Colorado Habitat Exchange-Executive Summary. (n.d.). Environmntal Incentives. Retrieved from http://enviroincentives.com/portfolio-item/colorado-habitat-exchange-executive-summary/

Coordinated Salmon Habitat Restoration on Private Lands. (2013, Spring). Retrieved from http://ewp.uoregon.edu/sites/ewp.uoregon.edu/files/FS2_Methow.pdf

Dispersed Water Management Program. (2014, July). South Florida Water Management District. Retrieved from http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/jtf_dispersed_water_mgmt.pdf

Dlugolecki, L. (2012, June). Economic Benefits of Protecting Healthy Watersheds: A Literature Review. Oak Ridge Institute of Science and Education. Retrieved from

http://www.chesapeakebay.net/channel_files/19384/economic_benefits_of_protecting_healthywatersheds_final.pdf

Go Zero Brochure. (n.d.). The Conservation Fund. Retrieved from http://www.conservationfund.org/our-conservation-strategy/major-programs/go-zero/

Harmon, R. (2010). *How the market can keep streams flowing*. Retrieved from http://www.ted.com/talks/rob_harmon_how_the_market_can_keep_streams_flowing

Healthy Headwater's Success Story: Santa Fe, New Mexico - Sustaining the Watershed. (n.d.). Carpe Diem West. Retrieved from http://www.carpediemwest.org/sites/carpediemwest.org/files/Santa%20Fe%20Success%20Story_0.pdf

Johnson, G. (2010, March). *AIRES*. Presented at the AIRES (Artificial Intelligence for Ecosystem Services) Workshop, Gund Insitute, University of Vermont.

Kansas opens more than 200,000 acres for Walk-In Hunting Access program. (2014, March 20). *NRAblog*. Blog. Retrieved July 9, 2014, from http://www.nrablog.com/post/2014/03/20/Kansas-opens-more-than-200000-acres-for-Walk-In-Hunting-Access-program-KDWPT.aspx

KDWP Offers Landowners Contracts for Walk-In Hunting Access. (2009, June 17). *Kansas Department of Wildlife, Parks and Tourism*. Retrieved from http://kdwpt.state.ks.us/KDWPT-Info/News/News-Archive/2009-Web-News/May-2009/KDWP-OFFERS-LANDOWNERS-CONTRACTS-FOR-WALK-IN-HUNTING-ACCESS

Mercer, D. E., Cooley, D., & Hamilton, K. (2011). *Taking Stock: Payments for Forest Ecosystem Services in the United States* (p. 56). Washington, DC: Forest Trends and USDA Forest Service.

Natural Area Information. (n.d.). *The City of Portland Oregon: Environmental Services*. Retrieved from https://www.portlandoregon.gov/bes/article/286175

Phillips, S. (2013). *User's guide to ecosystem services*. Charlottesville, VA: Key-Log Economics, LLC for the Model Forest Policy Program.

Postel, S. L., & Thompson, B. H. (2005). Watershed protection: Capturing the benefits of nature's water supply services. In *Natural Resources Forum* (Vol. 29, pp. 98–108). Wiley Online Library. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1477-8947.2005.00119.x/full

Prickly Pear Creek. (n.d.). *Clark Fork Coalition*. Retrieved July 8, 2014, from http://www.clarkfork.org/stream-renewal-initiative/prickly-pear-creek.html

Regulatory Background. (n.d.). *NYC Environmental Protection*. Government. Retrieved July 8, 2014, from http://www.nyc.gov/html/dep/html/watershed_protection/regulatory_background.shtml

Reid, W. V., Mooney, H. A., Cooper, A., Capistrano, D., Carpenter, S. R., Chopra, K., … Zurek, M. B. (2005). *Millennium Ecosystem Assessment, Ecosystems and Human Well-being: Synthesis*. Washington, DC: Island Press.

Smith, R. (2011, November 29). South Florida Water Management District News Release.

Sprague, E. (2010, Winter). Bay Bank- The Chesapeake's Conservation Marketplace. The Pinochet Letter.

Torvik, S. (2014, January 27). *Will They Come? Unprecedented Restoration Effort. Methow Grist*. Community Journal. Retrieved July 8, 2014, from http://www.methownet.com/grist/features/salmon_money.html

Turner, R. K., & Daily, G. C. (2008). The Ecosystem Services Framework and Natural Capital Conservation. *Environmental and Resource Economics*, *39*(1), 25–35. doi:10.1007/s10640-007-9176-6

US EPA, Office of Water. (1996, December). *Watershed Progress: New York City Watershed Agreement. United States Environmental Protection Agency*. Government. Retrieved July 8, 2014, from http://water.epa.gov/type/watersheds/nycityfi.cfm

USDA Forest Service. (2012). National Forest System Land Management Planning: Final Rule and Record of Decision. *Federal Register*, *77*(68), 21162–21276.

WIHA Temporary Brochure: Public Hunting Access & Your Land. (n.d.). Kansas Department of Wildlife, Parks and Tourism. Retrieved from http://kdwpt.state.ks.us/news/Services/Private-Landowner-Assistance/Wildlife/Walk-in-Hunting

Willing Seller Program. (n.d.). *The City of Portland Oregon: Environmental Services*. Retrieved from https://www.portlandoregon.gov/bes/article/106234