



Lessons Learned on Demand

DEMAND DYNAMICS OF ECOSYSTEM MARKETS IN THE UNITED STATES



AND

The National Network on Water Quality Trading

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Demand Dynamics of Ecosystem Markets in the United States

A report prepared for the National Network on Water Quality Trading by Ecosystem Marketplace, a Forest Trends initiative

February 2018

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Acknowledgments

We are grateful to the Steering Committee of the National Network on Water Quality Trading for their insights, which were invaluable in shaping the final report.


Graphics by Eszter Bodnar of Visilio Design. 

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Acronyms

ARB	Air Resources Board (California)
CCX	Chicago Climate Exchange
CSR	Corporate Social Responsibility
CWA	Clean Water Act
CODA	Compliance Offsets Developers Association
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
DFW	Department of Fish and Wildlife (California)
DMS	Division of Mitigation Services (North Carolina)
DOI	Department of Interior
ERBA	Ecological Restoration Business Association
ESA	Endangered Species Act
GHG	Greenhouse gas
ILF	In-lieu fee
NCDOT	North Carolina Department of Transportation
NEBA	National Environmental Banking Association
NMBA	National Mitigation Banking Association
NNWQT	National Network on Water Quality Trading
RFP	Request for proposals
RGGI	Regional Greenhouse Gas Initiative
RIBITS	Regulatory In-lieu Fee and Bank Tracking Information System
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WAFWA	Western Association of Fish and Wildlife Agencies
WOTUS	Waters of the United States

Executive Summary

This study on lessons learned about demand in ecosystem markets in the United States was commissioned to help the National Network on Water Quality Trading (NNWQT) identify transferrable lessons for their strategy on stimulating demand for water quality credits and other market-based incentives for nonpoint source water quality. A rapid review of historical experience in ecosystem markets in the United States suggests that across compliance markets, the fundamentals are the same: robust demand requires a co-occurrence of environmental impact, high costs or complexity of alternative compliance options, and a predictable regulatory process. Trading program administrators should also develop a clear understanding of threats to buyer confidence (particularly regarding liability risk and perceptions of market mismanagement) and consider the ways in which regulators are ultimately the gatekeepers of demand in compliance markets. Finally, offering the lowest-cost compliance option is not everything: predictability and simplicity matter too, and for some buyers, the broad benefits of restoration and conservation to their local environment and community are ultimately more important than credit price.

Introduction

Certain environmental markets, such as for carbon offsets, have taken off in the United States, but demand for water quality trading has been slow to develop in comparison.

It's time for a new strategy to understand why we aren't moving faster toward the widespread application of trading in places where it makes economic, social, and ecological sense. Water quality trading is a classic environmental market where buyers, typically water utilities, invest in ecosystem services from forests and farms to meet their regulatory requirements. Water quality trading offers a cost-effective, multi-benefit alternative to traditional gray infrastructure.

The National Network on Water Quality Trading (NNWQT) has been focusing on stimulating demand for water quality credits and other programs that incentivize restoring ecosystem services as a means of regulatory compliance. This effort has identified the barriers and the opportunities to increasing demand for credits from municipal wastewater and stormwater sectors.

To hone in on a subset of key barriers that NNWQT can take steps to address, the Network is conducting a water quality trading demand assessment. In this report, we extract lessons learned about the key drivers and contextual forces shaping demand for ecosystem services assets and credits, based on a rapid review of the historical performance of ecosystem markets in the United States carried out by Forest Trends' Ecosystem Marketplace. The rapid review assesses how policy/regulatory context, institutional factors, economic factors, market actors, market infrastructure and design, events/developments, and other forces played a role in stimulating or inhibiting demand.

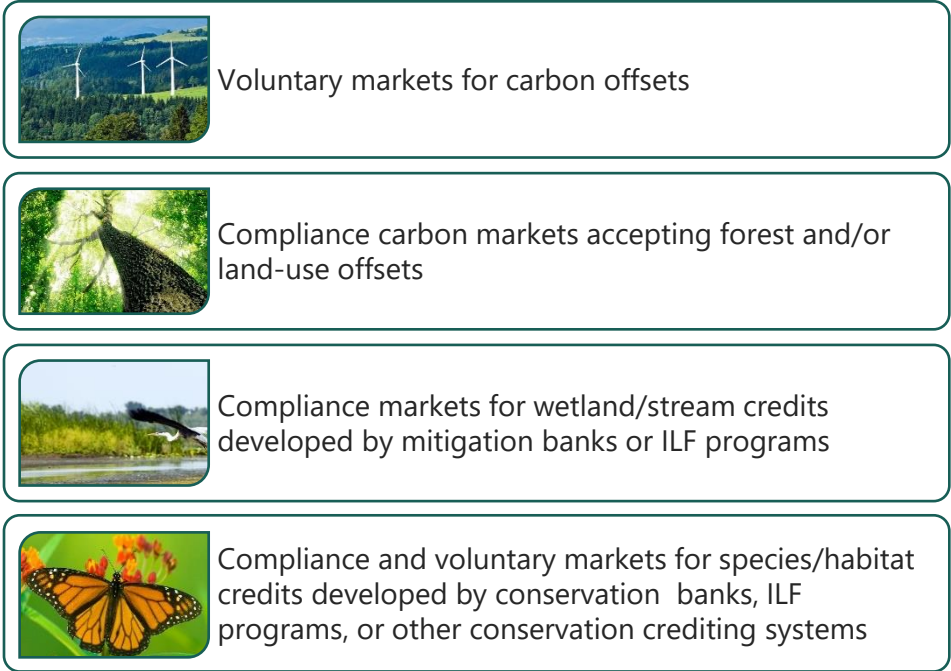
The report was prepared for the National Network on Water Quality Trading (NNWQT) to inform the Network's internal strategy for stimulating demand. This study was commissioned to help NNWQT take advantage of past experience and determine which lessons are transferrable to their work to stimulate demand for water quality credits and other market-based incentives for nonpoint source water quality improvements (referred to collectively in this report as "water quality trading"). Findings can also inform NNWQT's evaluation of what may not be transferrable, e.g., what characteristics of water quality markets may be new and different, compared to other environmental markets, when it comes to engaging buyers.

The report begins with a short overview of ecosystem markets in the United States, followed by a summary of key factors influencing demand across markets and their potential implications for water quality trading.

Research Methods

The report’s scope includes the following markets: voluntary markets for carbon offsets (including all offset project types); compliance carbon markets accepting forestry and/or land-use offsets; compliance markets for wetland/stream credits developed by mitigation banks or in-lieu fee (ILF) programs; and compliance and voluntary markets for species/habitat credits developed by conservation banks, ILF programs, or other emerging conservation crediting systems (Figure 1).

Figure 1. Ecosystem Market Mechanisms Reviewed in This Report



These markets were chosen because they are the most prominent ecosystem services markets in the United States in terms of transaction activity, and because sufficient data and analysis exists on these markets to support a review of lessons learned on stimulating demand.¹ Ecosystem markets outside of the United States have been generally excluded from this study’s scope, since the “rapid” nature of this review favors a focus on markets with a shared institutional context, where lessons learned are most likely to be transferrable.

The rapid review explored a range of sources documenting and evaluating historical developments in ecosystem markets in the United States, including academic literature; journalistic coverage; and “grey” literature, including conference presentations and proceedings, press releases, program reports, weblogs, registries, and government databases. Authors consulted Ecosystem Marketplace’s historical published markets analysis and unpublished internal data extensively. The rapid review relied on a “purposive” sampling approach to identify highly relevant, information-rich sources, rather than a comprehensive literature review.

¹ In this report we use the term “markets” flexibly to refer to a spectrum of market-based mechanisms, which can be relatively more or less “market-like” in terms of a system where buyers and sellers freely exchange goods, services, or information, with prices set by the laws of supply and demand.

Ecosystem Marketplace’s proprietary data on markets covers the period 2008-2016; findings and graphics based on these datasets are thus constrained to that time period except where comparable data was available for wetland/stream and species/habitat markets from the Regulatory In-lieu Fee and Bank Tracking Information System (RIBITS) maintained by the United States Army Corps of Engineers (USACE). The literature review focuses primarily on developments between 2000 and 2016; prior to 2000 the markets covered in this study did not exist or were extremely immature. The exception is the wetland/stream compensatory mitigation market, where some developments prior to 2000 are included in our analysis.

Analysis was qualitative and based on a “grounded theory” approach using an iterative process of data collection and analysis to extract lessons learned on factors influencing demand in ecosystem markets (Bernard 2000). A grounded theory methodology begins with general questions and uses iterative coding and gradual development of analytic concepts and categories to interpret evidence and build toward more substantive theory. This approach allowed the review team to iteratively collect and analyze new information as needed and respond to input from the National Network project team and steering committee received at a meeting on December 1, 2017 where preliminary findings were presented.

Scoping, data collection and analysis, and report preparation took place between September 2017 and January 2018. Given this short timeline, limited resources, and the goal of producing a concise overview of lessons learned, this study could not carry out comprehensive literature review nor a full application of the grounded theory approach methodology. These limitations should be considered by the reader. We also encourage readers to review and understand Ecosystem Marketplace’s methodology for data collection for our “State of” reports and other market data gathering and analysis (Forest Trends’ Ecosystem Marketplace 2018).

Overview of Markets

Voluntary Markets for Carbon Offsets

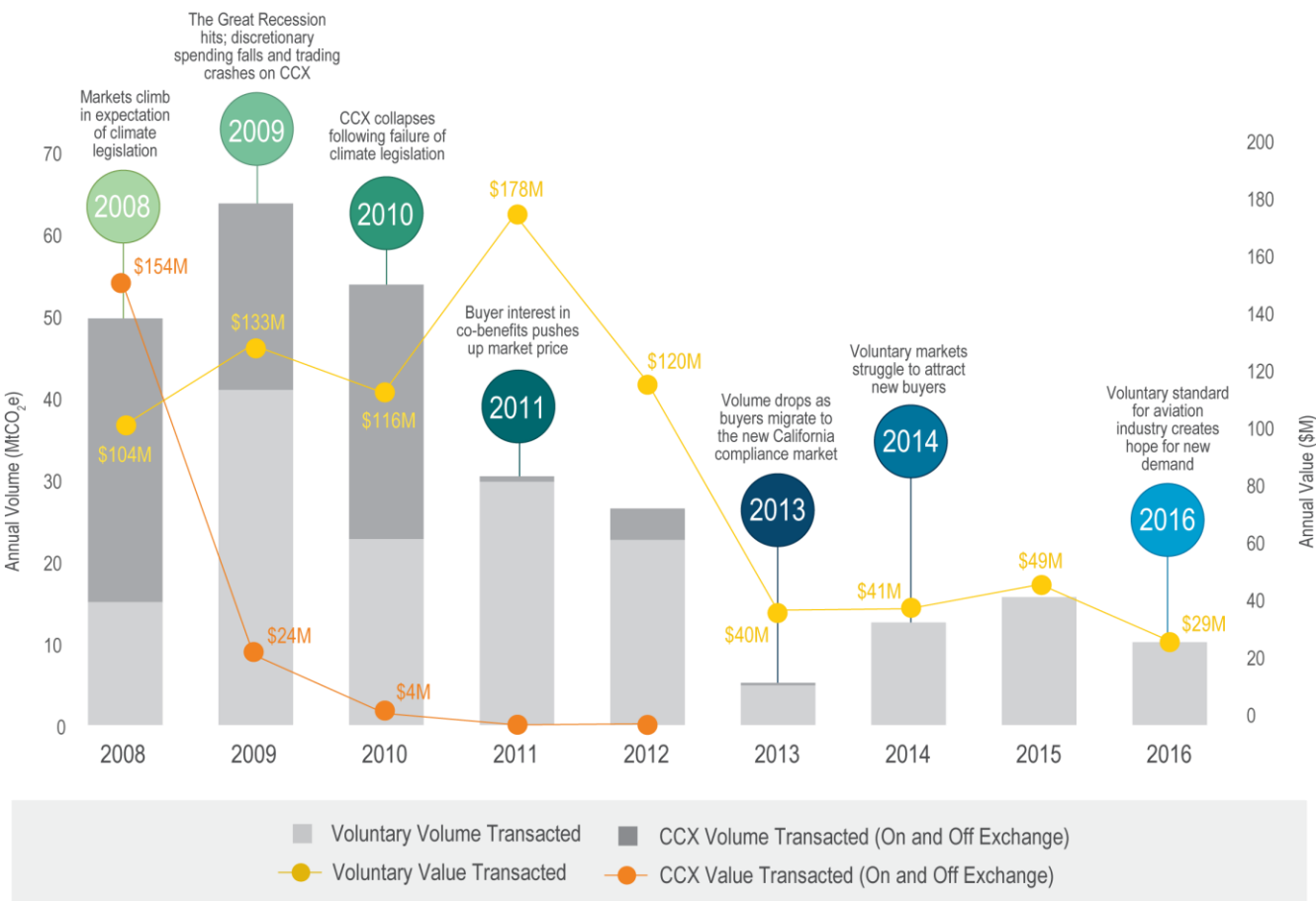
To create offsets, project developers undertake activities that reduce, avoid, or sequester greenhouse gases (GHGs), like tree planting or investments in renewable energy projects. Next, they sell units of emissions reductions, measured in units of metric tonnes of carbon dioxide equivalents (tCO₂e) called carbon offsets, transferring the rights to claim those reductions from the project developer to the buyer. Carbon offsets can be bought and sold in either voluntary or compliance markets, depending on whether buyers are motivated by regulatory requirements (like a cap-and-trade program) or their own voluntary emissions reduction goals. There is no unified voluntary carbon offset market, but rather thousands of discrete buyers and sellers exchanging payments for metric tonnes of GHGs. Voluntary offset buyers may be motivated by the expectation of future regulation (“pre-compliance”) or by purely voluntary motives, such as corporate social responsibility (CSR).

Within the United States, the voluntary market has long served as a testing ground for methodologies and market actors that have later found their way into compliance markets. The first United States-wide carbon trading activity was conducted through businesses participating in the voluntary Chicago Climate Exchange (CCX). The CCX had potential to influence methodologies accepted into a potential US cap-and-trade program proposed by the American Clean Energy and Security Act.² However, although the House of Representatives passed the bill in June 2009, the legislation never made it through the Senate. The voluntary markets also laid the foundation for the protocols adapted by California’s Air Resources Board (ARB) for compliance offset project use in the California-Québec-Ontario market and continue to innovate new project types and methodologies.

Over the years, the total volume of voluntary offsets transacted has varied greatly. When Ecosystem Marketplace first began tracking the global voluntary offset market in 2005, just 12.5 million tCO₂e (MtCO₂e) were traded. The global market grew from 2005 to 2008, when it peaked at 134.5 MtCO₂e, of which 49.6 MtCO₂e was in North America (i.e., the United States and Canada, excluding Mexico) (Figure 2). Between 2009 and 2011, the North American market dropped to 30.3 MtCO₂e. Since 2011, the total market volume in North America has hovered between approximately 5 and 30 MtCO₂e per year. Value peaked in 2011 with \$178 million (M) in reported value flowing to projects, which by 2016 had fallen to \$29M. In 2016, we tracked 10.1 MtCO₂e transacted in the voluntary carbon markets in North America.

² When the House of Representatives passed the climate and energy bill in 2009, the bill included recognition for GHG reduction activities done by corporations through CCX. CCX’s strong relationships with the US Department of Agriculture and farm lobby led many to believe their agricultural methodologies might serve as a blueprint for potential agricultural offsets allowed under the national cap-and-trade program proposed by the bill.

Figure 2. Volume and Value of Voluntary Carbon Offsets Transacted by North American Projects, 2008-2016



- 2006 Ecosystem Marketplace's first survey of voluntary carbon markets finds \$91 M in transactions worldwide. Amidst controversy over a perceived lack of project standards, buyers assert that offset quality is more important than price.
- 2008 Chicago Climate Exchange (CCX) trading volumes overtake the over-the-counter market on the back of climate legislation proposed in the US in 2008.
- 2009 Global market volume declines 26% and value falls 47% from 2008, as companies cut back on discretionary funding for corporate social responsibility initiatives, and prospects for new compliance demand remain uncertain.
CCX prices crash along with demand, thanks to a drop in speculative activity and a shift to the over-the-counter market as buyers seek more customized offset credits.
- 2010 Transactions collapse again on the CCX due to the US Senate's failure to secure a climate bill. Legacy CCX offset tonnes will continue to be traded through February 2013, but at rock-bottom prices.
- 2011 Demand for offsets from emerging projects with significant environmental and social co-benefits pushes the market-wide average price above \$6.2/tCO₂e.
- 2013 Pre-compliance offsets fall from 9.7 MtCO₂e in 2012 to 0.3 MtCO₂e in 2013. Nearly all of the missing volume has migrated into the California cap-and-trade market.
Prices in the "purely" voluntary markets fall. Project developers blame falling demand on too much supply, a glut of uncharismatic project types, and declining demand from companies seeking to meet corporate social responsibility commitments.
- 2014 Voluntary offset prices continue their downward trend, attributed to a lack of new buyer demand. This year, only 5% of buyers are new to the market. Suppliers tell Ecosystem Marketplace that experienced buyers' greater market familiarity increases their ability to negotiate lower prices.
- 2016 The International Civil Aviation Organization finalizes its proposed standard to reduce emissions in all new aircraft and adopts its Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which could dramatically increase demand for carbon offsets.
- 2017 President Trump announces his decision for the United States to withdraw from the Paris Agreement. In the wake of the announcement, over 1,400 US cities, states, universities, and companies have announced their intention to voluntarily commit to the Paris Agreement.

Figure 2 notes: Data is shown for all North American projects (i.e., the United States and Canada, excluding Mexico); United States-only data could not be disaggregated. This figure was developed based on the source dataset [unpublished] for Hamrick and Gallant 2017b. Historical issuance data for offsets traded on the CCX is no longer accessible online following the closure of the CCX, and thus it was not possible to verify what share of offsets came from projects in the United States. We used the conservative assumption that half of CCX volume and value traded came from US projects.

Compliance Carbon Markets Accepting Forest and/or Land-use Offsets

In the early days of carbon markets, forest and land-use offset sales only occurred in voluntary markets. More recently, state governments have created markets for these carbon offsets through the use of carbon pricing systems. Compliance carbon markets permit greenhouse gas emitters obligated to reduce their emissions to use offsets for at least a portion of their reductions. Not all carbon pricing systems include offsets, and of those that do, not all allow offsets from forest and land-use projects. In 2017, Ecosystem Marketplace tracked 17 active compliance carbon markets worldwide that accept carbon offsets from forest and/or land-use projects (Hamrick and Gallant 2017).³

The United States is home to two active compliance markets: California's cap-and-trade program, which is linked to compliance carbon markets in Québec and Ontario, and the Regional Greenhouse Gas Initiative (RGGI).⁴ The California Air Resources Board (ARB), which manages the program, has approved offset protocols as of early 2018 for projects reducing or sequestering emissions from forestry, including a specific protocol for urban forestry, as well as from livestock, ozone-depleting substances, mine-methane capture, and rice cultivation. While RGGI theoretically allows for the use of forest offsets as well, so far, RGGI allowance prices have remained low, and no forestry carbon offsets have been transacted.

Oregon's Carbon Dioxide Standard is not a traditional cap-and-trade market. Instead, new power plants in the state are required to reduce carbon dioxide emissions in one of three ways: through onsite emissions reductions; by developing emissions reduction projects offsite; or by funding emissions reduction projects carried out by a nonprofit (to date, only one nonprofit, the Climate Trust, has gained recognition from Oregon as a carbon offset manager).

Since the California market launched in 2013, we have tracked 18.7 MtCO₂e of forestry and land-use offsets transacted and more than \$133M in transactions for 2013-2015 (Figure 3; at the time of this report's writing, transaction value data for 2016 and 2017 were unavailable). ARB has issued (that is, approved for sale on the compliance market) more than 60 MtCO₂e in forest offsets during the early action and compliance periods, comprising 71% of all offsets issued for the market to date (California Air Resources Board 2018).

The United States' other market for carbon offsets, RGGI, has not transacted any forest offsets to date. Offsets are permitted as a cost-containment mechanism in RGGI, to be used for up to 3.3% of a regulated power plant's compliance obligation if allowance prices reach a certain threshold. Since RGGI's launch in 2009, allowance prices have remained relatively low, and the first offset issuance did not take place until 2017, for a landfill gas project in Maryland.

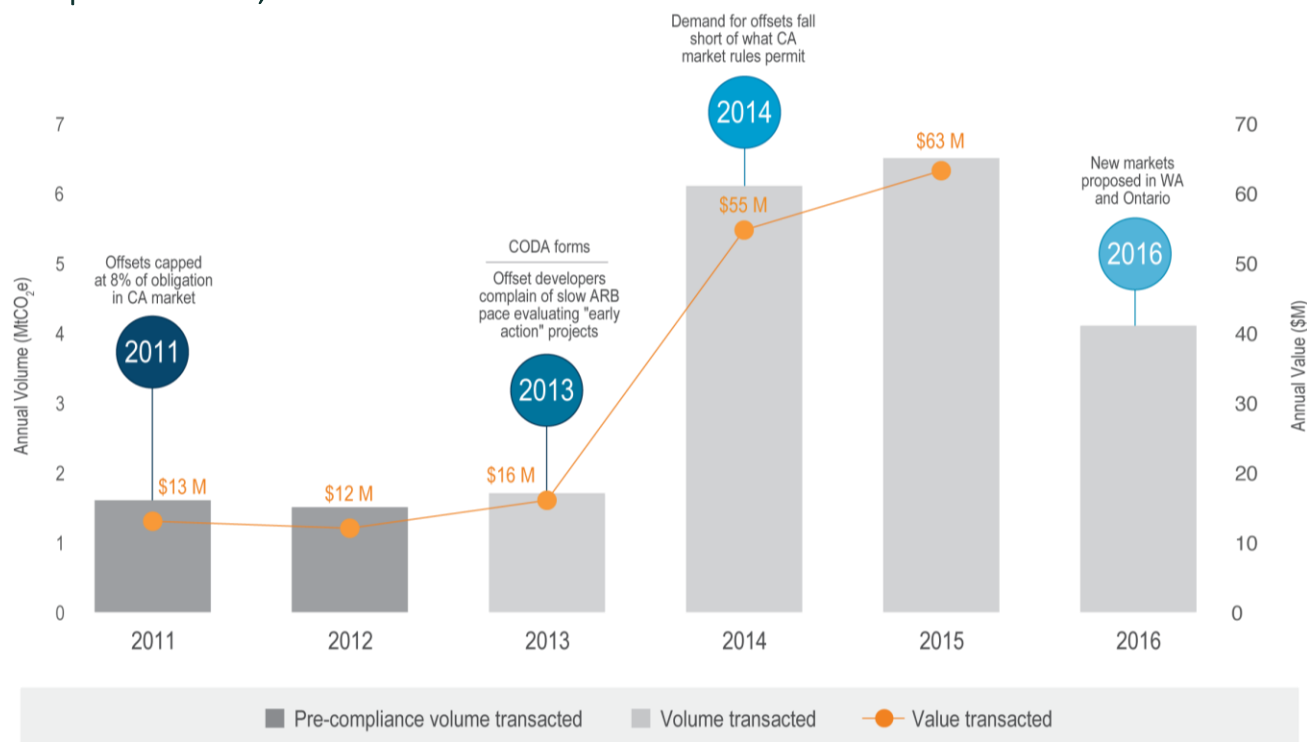
³ Forest and land-use carbon projects includes both forestry projects (such as tree-planting, avoided deforestation, improved forest management) and other land-use projects that increase carbon sequestration in non-forest landscapes including wetlands, grasslands, agriculture, and more.

⁴ States currently participating in RGGI are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

In Oregon, since the Climate Trust delivered its first offsets to a buyer in 2003, a total of \$34.2M has been paid out by power plants to secure offsets as of the end of 2016 (The Climate Trust 2017). That has translated into more than 3.5 MtCO₂e in verified emissions reductions and 5.8 MtCO₂e in total emissions reductions contracted. An estimated 30% of transacted offset volume has been for forest offsets. The Climate Trust has also worked with Ducks Unlimited to pilot and transact offsets from projects that avoid grasslands conversion.

In 2016, the state of Washington announced its Clean Air Rule, which imposes emissions caps on organizations that emit 90,700 tCO₂e or more annually. The rule allows for offsetting under select methodologies from projects based in Washington only. However, the program was met almost immediately with legal challenges, and no offset transactions have occurred to date.

Figure 3. Volume and Value of Forest and Land-Use Offsets Transacted in the California/Quebec Compliance Market, 2011-2016



2005 The Regional Greenhouse Gas Initiative (RGGI) Memorandum of Understanding (MOU) is signed by seven states.

2006 The California Global Warming Solutions Act of 2006 establishes emissions reduction targets. It includes a cap-and-trade program using offsets as a cost-containment measure. Forest offsets are allowed from projects from non-federal lands anywhere in the lower 48 states and some parts of Alaska.

2009 RGGI compliance period begins. Afforestation offsets are permitted as a cost containment mechanism to meet up to 3.3% of a covered entity's emissions, with higher amounts allowed if allowances rise above certain thresholds. Non-RGGI states need an MOU in order for their projects to sell offsets into the RGGI market. Project developers tell Ecosystem Marketplace they are virtually ignoring RGGI and focusing on the California market.

2010 A dispute over a forest offset protocol issued by the Climate Action Reserve leads to a legal challenge by the Center for Biological Diversity. Under the threat of litigation the California Air Resources Board (ARB) suddenly recalls its approval pending additional review of all four voluntary offset standards, which project developers had assumed were guaranteed a place in the future compliance market.

2011 ARB adopts final cap-and-trade program regulations. Offsets are allowed for 8% of total compliance obligations.

2013 The Compliance Offset Developers Association forms to work with the California Air Resources Board on procedural and technical issues related to offsets in the California market. Development of forest carbon projects for California is initially slow due to the snail's pace of ARB issuance of offsets for "early action" projects.

2014 Demand for carbon allowances in Québec soars in the first auction after Québec officially linked its cap-and-trade program to California's system. Amendments to California cap-and-trade rules shift the risk of invalidation for forestry offsets away from forest owners to regulated emitters that submit the offsets for compliance. The new buyers' liability provisions bring forestry projects in line with other project protocols. The US Environmental Protection Agency (USEPA) releases its draft Clean Power Plan. Its language rules out the possibility of using carbon offsets as a compliance mechanism in the proposed regulation. Carbon offsets can still be used within state and regional trading programs and to meet state obligations, but would not count toward reductions required by the USEPA in the power sector. Trading of offsets for the California market drops substantially during ARB's five-month investigation of an Arkansas facility producing ozone-depleting substances offsets. Invoking buyers' liability provisions, ARB ultimately invalidates 85,955 offsets. The first compliance period of California's cap-and-trade program wraps up, with demand for offsets coming in below market potential. Among the reasons are the limited number of offsets protocols, the high degree of care exercised by ARB in the verification and issuance process, and lingering concerns over invalidation risk.

2016 Ontario issues proposed regulations for a cap-and-trade program that will link to California's and Québec's programs. RGGI allowance prices begin to fall as it becomes clear that Clean Power Plan will not be implemented.

The state of Washington announces its Clean Air Rule, which imposes emissions caps on organizations that emit 90,700 tCO₂e or more annually. The rule allows for offsetting under select methodologies from projects based in Washington only. Local industry groups file lawsuits against the ruling, which are still pending decisions.

2017 ARB extends its cap-and-trade program through 2030. Under pressure from environmental justice advocates, beginning in 2021 the share of offsets allowed will drop from 8% to 4% of total compliance obligation (rising to 6% in 2026), and at least half of offsets must come from projects "directly benefitting" California. RGGI issues 16,003 carbon offsets from the New Beulah Landfill Gas Reconstruction Project in Maryland, the market's first carbon offsets issued.

Virginia state legislators approve a plan to launch a state-wide cap-and-trade program linked with RGGI.

A judge strikes down part of Washington's Clean Air Rule, finding that the state Department of Ecology lacks authority to regulate major emitters including suppliers of natural gas and petroleum products.

Figure 3 notes: The total volume of offsets transacted in 2016 appeared to decline in comparison to 2015, most likely because we missed a major market participant in our tracking data. We do not believe this reflects an actual drop in total transaction volumes for the year. This figure was developed based on the source dataset [unpublished] for Hamrick and Gallant 2017a.

Compliance Markets for Wetland/Stream Credits Developed by Mitigation Banks or ILF Programs

Compensatory mitigation is an umbrella term for the three main mitigation types (permittee-responsible mitigation, ILF payments, and mitigation banking) that may be used as the final step of the mitigation hierarchy to address residual negative impacts to aquatic resources from development. This report focuses on the latter two mechanisms, ILFs and mitigation banking, wherein offset credits or activities are purchased from third party-providers. In the United States, compensatory mitigation may be required for applicants filing for permits to drain, fill, or dredge a wetland or stream under Section 404 of the Clean Water Act (CWA). Compensatory mitigation driven by CWA §404 is overseen by USACE, which interprets and implements regulations at the regional level, and the United States Environmental Protection Agency (USEPA).

Compliance compensatory mitigation for wetlands and streams in the United States is not a unified nationwide market. Offsets must be sourced from projects within the same watershed (known as the “service area”) as the impact, typically designated by United States Geological Survey Hydrologic Unit Codes at the 8-digit level.

In April of 2008, USACE and USEPA jointly issued the Final Rule on Compensatory Mitigation for Losses of Aquatic Resources. Previous guidance on compensatory mitigation created differing drivers and standards for the three categories of offset supply: permittee-responsible mitigation, mitigation banks, and ILF payments. The new regulations in 2008 introduced a watershed focus and gave preference to larger, landscape-scale offsets created before the impact. (Previous guidance favored on-site restoration.) The new rules give a stated preference hierarchy of offsets from mitigation banks (first preference) or ILF programs (second) as opposed to permittee-responsible offsets (third). The new rules also provide equivalent standards for all categories of supply credits. Now, anyone creating credits—be it a developer, non-governmental organization (NGO), government, or for-profit organization—will have to create most of their credits before they can sell them and will have long-term funding requirements. The new rules have resulted in greater equivalency among mitigation options, though full implementation across districts remains uneven.

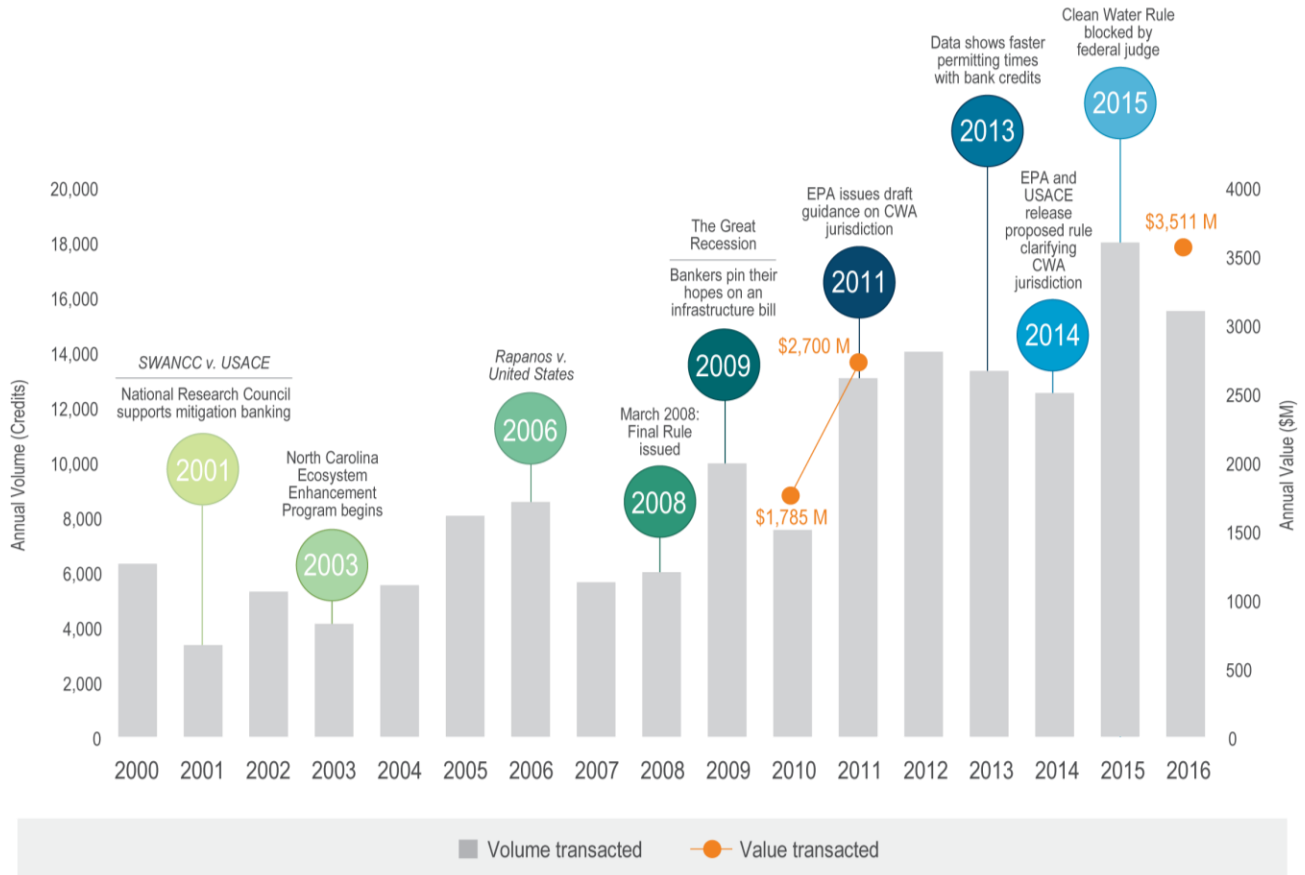
Wetland and stream compensatory mitigation is the largest and best-established ecosystem market in the United States, transacting an estimated \$3.5 billion in credits⁵ in 2016 (Figure 4) (Bennett et al. 2017). In 2016, mitigation banks in the United States transacted nearly 1.1M credits representing 15,465 acres of wetland habitat and 299,013 linear feet of streams (United States Army Corps of Engineers 2017). The greatest number of transactions took place in Alabama, Florida, Georgia, Louisiana, Minnesota, North Carolina, Texas, and Virginia—all states where numerous wetlands, streams, and coastlines coincide with a high level of development. These states also often have fewer ILF programs providing an alternative mitigation option.

The most ILF program transactions occurred in California, Florida, Kentucky, New Hampshire, Ohio, Virginia, and Wisconsin in 2016. ILFs often serve states or regions where demand for compensatory mitigation is relatively lower, precluding bank establishment. Since banks develop mitigation projects in advance of demand for credits, they require significant upfront capital and a bank developer willing to assume substantial risk. Consequently

⁵ Crediting methodologies for wetlands and streams vary considerably by regulator preference (generally at the level of the USACE district) and biophysical context. Thus unlike a tCO₂e, a “wetland” credit from one site is not directly comparable with a credit from another site in terms of the area, habitat type, function, or condition represented.

banks are unlikely to be established where demand is low or unpredictable. Meanwhile, ILF programs usually develop mitigation projects *after* the transaction with the buyer takes place and thus do not need to take on risk financing restoration/conservation or in predicting demand (Stephenson and Tutko 2016). ILF programs also lack the constraint of a profit motive: though the majority of mitigation banks are privately owned and operated, ILF programs must be administered by a public or nonprofit entity. This means they are often viable in places where commercial mitigation banks are not.

Figure 4. Volume and Value of Wetland and Stream Credits Transacted in the United States, 2000-2016



- 2001** The National Research Council publishes an assessment of wetland compensatory mitigation, finding that mitigation banking has some advantages over other mitigation types.
Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers finds that the US Army Corp of Engineers (USACE) does not have jurisdiction over hydrologically isolated wetlands on the basis of the so-called "migratory bird rule." Projects report that demand for credits falls by as much as 50% in the Chicago area as a result.
- 2003** North Carolina begins its Ecosystem Enhancement Program (later renamed the Division of Mitigation Services) with capital supplied by the state Department of Transportation.
- 2006** *Rapanos v. United States*, in attempting to clarify the Clean Water Act's jurisdiction, results in greater overall confusion.
- 2008** USACE and the US Environmental Protection Agency (USEPA) release the Final Rule, ushering in a raft of changes to compensatory mitigation and creating new demand for third-party mitigation. The share of wetland acreage mitigated through bank credits or In-Lieu Fee programs (ILFs) will grow from 25% in 2010 to over 40% of impacts by 2014.
- 2009** The "Great Recession," which will last until 2012, stalls real estate development, one of the main drivers of mitigation demand. Decreased federal budgets also mean decreased demand for mitigation for large infrastructure projects.
Mitigation bankers pin their hopes on a federal stimulus package to shore up demand as private buyers evaporate in the recession. However, the majority of infrastructure stimulus dollars are earmarked for "shovel-ready" projects (e.g., already permitted or in an advance stage of permitting), which create little new demand for compensatory mitigation.
- 2011** USEPA issues draft guidance on Clean Water Act jurisdiction, attempting to put to bed uncertainty over the issue and particularly the definition of "significant nexus."
- 2013** Bankers take advantage of improvements in transparency, using USACE data to demonstrate that permitting is significantly faster when bank credits are used compared to other mitigation types.
- 2014** USEPA and USACE release a proposed rule aimed at clarifying which waters are protected under the Clean Water Act. The proposed rule rallies opponents of perceived expansion of federal jurisdiction in the legislative, agriculture, energy, and property development spaces, who launch a fierce campaign to prevent the proposal from becoming regulation.
- 2015** USEPA and USACE release a final version of the Clean Water Rule.
Hours before the Clean Water Rule is due to go into effect, a federal judge in North Dakota issues a temporary injunction that will halt implementation in 13 states.
- 2017** The National Mitigation Banking Association splits into two factions: the Ecological Restoration Business Association, which broadens its umbrella to include other members of the restoration industry, and the National Environmental Banking Association, which remains focused on mitigation banking.
President Trump issues an executive order calling on USACE and USEPA to review the "Waters of the United States" rule and either rescind or revise it.

Figure 4 notes: Estimated annual transaction value is only available for the years 2010, 2011, and 2016. Data on credit volume transacted comes from: U.S. Army Corps of Engineers. (2017). "Credit tracking for all USACE districts." *Regulatory In-lieu Fee and Bank Tracking Information System* [dataset]. Retrieved May 19, 2017 from <https://ribits.usace.army.mil/>. Data on estimated value of transactions comes from: Bennett, Genevieve, Melissa Gallant, and Kerry ten Kate. *Offsets and Compensation for Global Infrastructure Development: State of Biodiversity Mitigation 2017*. Washington DC: Forest Trends, 2017.

Compliance and Voluntary Markets for Species/Habitat Credits Developed by Conservation Banks, ILF Programs, or Other Conservation Crediting Systems

Conservation Banking and In-Lieu Fees

Conservation banks are permanently protected sites where habitat is conserved and managed in perpetuity for the purpose of offsetting impacts that have occurred elsewhere to endangered, threatened, candidate, or other species of concern.⁶ Conservation banking is enabled in the United States by the legal requirements of the Endangered Species Act (ESA). Specifically, Section 7 requires federal agencies to consult with the United States Fish and Wildlife Service (USFWS) regarding potential impact to threatened and endangered species, and Section 10 requires "incidental take permits" and Habitat Conservation Plans for those impacts. USFWS is the principal agency that administers the ESA with respect to terrestrial and freshwater species, while the National Marine Fisheries Service is the lead agency with respect to marine and anadromous species.

In May 2003, USFWS released the official federal guidance for the establishment, use, and operation of conservation banks. This guidance was closely modeled after the State of California's guidance for conservation banks, which has been in place since 1995. California is a leader in conservation banking and uses its state Endangered Species Act and Environmental Protection Act to facilitate conservation banking with the California Department of Fish and Wildlife (DFW) as the enforcing agency. While a "conservation banking agreement" is the most standardized mechanism for creating bankable endangered species credits, other types of legal agreements have been used in the past, including wetland banking agreements, safe harbor agreements, habitat conservation plans, and memorandums of agreement.

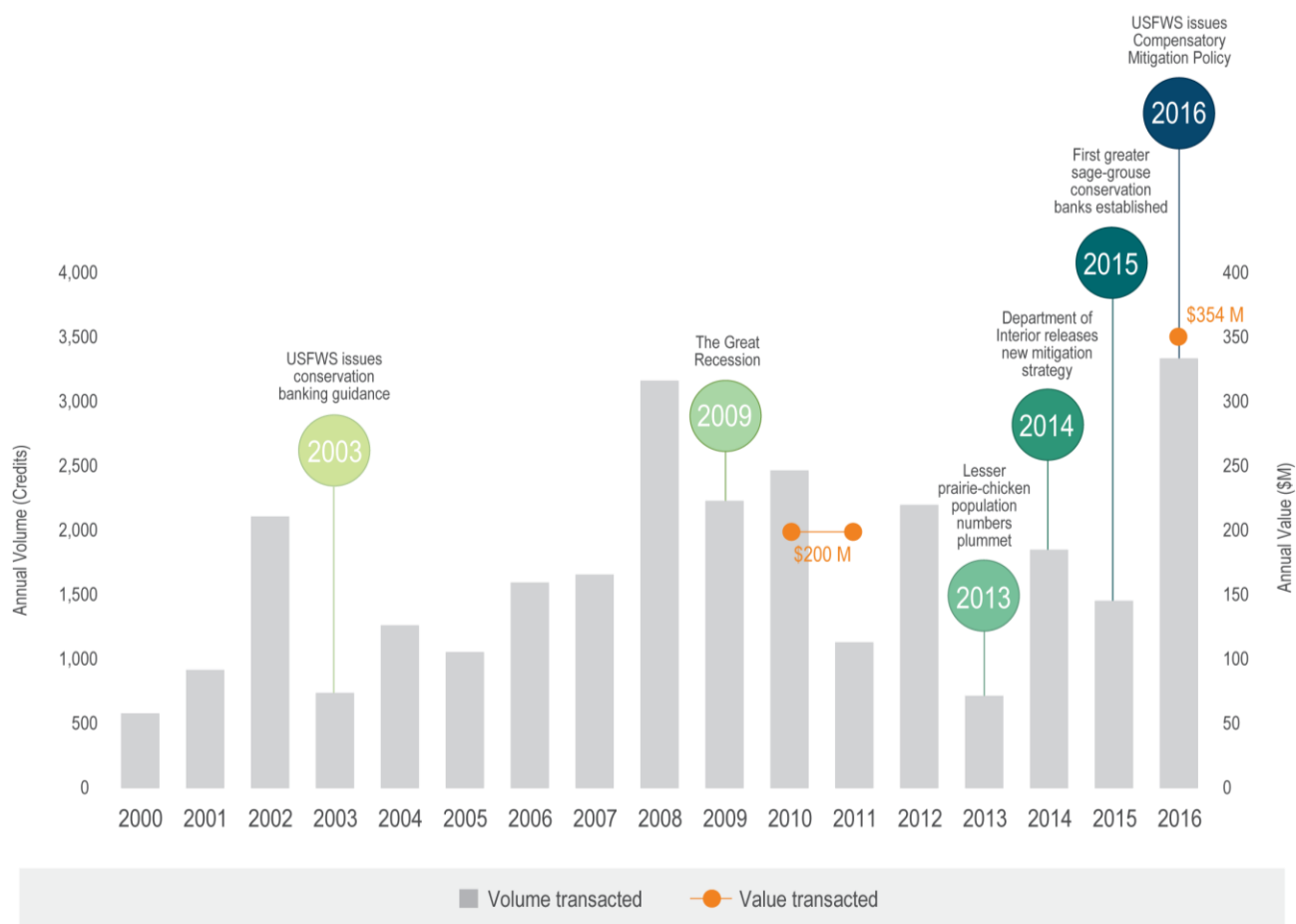
As of January 2018, the USFWS has approved 149 banks (including 126 active and 23 sold out) (United States Army Corps of Engineers 2018). Collectively, approved conservation banks permanently protect 184,573 acres of habitat.

The majority of conservation banks exist in California, protecting species such as the kit fox, tiger salamander, and vernal shrimp. Other states with relatively high concentrations of banks are Florida, Texas, and Utah.

The annual value of conservation bank credits transacted in the United States was estimated to total about \$354M in 2016 (Figure 5). Credits transacted in 2016 represent 3,337 acres of habitat conserved, restored, or created/re-established. All credit sales took place in just a few states: Arizona, California, Florida, Oklahoma, Oregon, and Texas. More than two-thirds of this activity by land area was in Oklahoma, where credits for 2,385 acres of American burying beetle habitat were sold in 2016. California, meanwhile, saw the largest number of individual transactions that year: 115 out of a total of 273 transactions.

⁶ Although virtually all conservation bank demand and supply currently is driven by compliance with the ESA, conservation banks developing candidate species credits for voluntary buyers have also been piloted in several states.

Figure 5. Volume and Value of Species and Group Credits Transacted in the United States, 2000-2016



2003 The US Fish and Wildlife Service (USFWS) issues its first guidance document on conservation banking.

2009 The "Great Recession," which will last until 2012, stalls real estate development, one of the main drivers of mitigation demand. Decreased federal budgets also mean decreased demand for mitigation for large infrastructure projects.

2013 A report on the status of the lesser prairie-chicken finds fewer than 18,000 birds range-wide—down from more than 34,000 last year and from numbers in the millions just a half-century ago.

2014 The US Department of Interior releases a strategy aimed at improving mitigation policies. Goals of the strategy include enhancing conservation outcomes and improving the efficiency of permitting for infrastructure and development projects.

2015 Barrick Gold Corporation, USFWS, The Nature Conservancy, and the Bureau of Land Management sign a deal to establish a conservation bank for greater sage-grouse habitat credits. The same month, the Sweetwater River Conservancy opens the first greater sage-grouse conservation bank in Wyoming. It is the largest conservation bank in the United States.

A consortium of energy companies and nonprofit organizations in collaboration with the Western Association of Fish and Wildlife Agencies (WAFWA) creates the Lesser Prairie-Chicken Range-wide Conservation Plan.

USFWS decides that a listing status under the Endangered Species Act for the greater sage-grouse is not warranted.

President Obama releases a memorandum to strengthen and streamline landscape-level mitigation policy within five federal agencies, directing them to follow the mitigation hierarchy.

2016 USFWS removes the lesser prairie-chicken from the Endangered Species List.

USFWS issues its Compensatory Mitigation Policy. It borrows many tenets of wetland/stream compensatory mitigation, including a preference for advance mitigation, and a stated goal of "no net loss" or "net gain" for protected species.

2017 President Trump issues an Executive Order directing federal agencies to rescind or remove mitigation policies passed under the previous administration. Interior Secretary Ryan Zinke responds soon after with an order directing land management agencies to review mitigation policies to identify any that "unnecessarily burden the development or utilization of the Nation's energy resources."

The first greater sage-grouse credit transaction takes place in Nevada. The buyer is Kinross Gold Corporation, which has voluntarily committed to mitigate for impacts to sage-grouse from its Bald Mountain gold mine.

Just before year-end, the US Department of Interior issues an order rescinding the Department's Climate Change Policy, Landscape-Scale Mitigation Policy, and two Bureau of Land Management mitigation policies.

Figure 5 notes: Data on credit volume transacted comes from: U.S. Army Corps of Engineers. (2017). "Credit tracking for all USACE districts." *Regulatory In-lieu Fee and Bank Tracking Information System* [dataset]. Retrieved May 19, 2017 from <https://ribits.usace.army.mil/>. Data on estimated value of transactions comes from: Bennett, Genevieve, Melissa Gallant, and Kerry ten Kate. *Offsets and Compensation for Global Infrastructure Development: State of Biodiversity Mitigation 2017*. Washington DC: Forest Trends, 2017.

Conservation Crediting Systems

Outside of conservation banking, a number of other models are in various stages of development for transacting species or habitat credits on a voluntary or pre-compliance basis. These include Habitat Exchanges and habitat crediting systems.

Habitat Exchanges are platforms to trade habitat or species credits among multiple buyers and sellers. Habitat Exchanges may exist for voluntary, pre-compliance, and compliance-driven mitigation. To date, many have focused on candidate species, e.g., species where USFWS has determined that Endangered Species Act listing is warranted based on the best available science but precluded by other species' being a higher priority for protection. The Environmental Defense Fund in coordination with local partners and federal agencies is developing habitat exchanges for the Monarch butterfly (in California, Iowa, and Texas), the greater sage-grouse (in Colorado and Wyoming), the Utah prairie dog (in Utah), and Chinook salmon, Swainson's hawk, riparian songbirds, and the giant garter snake (in California's Central Valley).

Habitat crediting systems also develop species or habitat crediting methodologies for voluntary, pre-compliance, or compliance markets but may not establish an exchange platform to mediate trades between many buyers and sellers. In Oregon, a Fish Passage Banking Pilot has been proposed using a salmonid habitat crediting system (Oregon Department of Fish and Wildlife 2015). A conservation crediting strategy was proposed by the Department of Defense for the gopher tortoise in Alabama, Florida, Georgia, and South Carolina, although it faltered when USFWS was unwilling to provide assurances that voluntary actions would count toward future conservation obligations or resource/land use restrictions if the tortoise were ultimately listed. Finally, Oregon's Ecosystem Credit Accounting System has established crediting protocols for sagebrush/sage-grouse, oak woodland, freshwater wetland, salmonid, and upland prairie habitat.

For the most part, these are emerging or early-stage mechanisms that have posted little activity to date. The first-ever transaction using a Habitat Exchange took place in Nevada in November 2017, with the sale of greater sage-grouse credits to Kinross Gold Corporation. Kinross Gold has voluntarily committed to mitigate for impacts to sage-grouse from its Bald Mountain gold mine. Other habitat crediting systems, including the Willamette Ecosystem Credit Accounting System, have retired a number of habitat/species credits as well. But all of these efforts to date have been mainly geared toward demonstration; we believe that as of early 2018 there is insufficient experience in the space to draw many conclusions about demand drivers.

Comparing Ecosystem Markets

Market rules vary in some fundamental respects across the carbon, wetland/stream, species/habitat, and water quality spheres (Table 1). In particular, credit life (i.e., whether a credit purchase represents a permanent fulfillment of a regulatory obligation or short-term credits must be regularly secured) and regulatory liability transfer (whether the credit provider assumes liability for the buyer's regulatory obligation) vary across markets and can influence potential buyers' decisions whether and how to participate in the market.

Table 1. Markets in North America: Annual Value, Credit Type and Life, and Liability Transfer

Market	Estimated annual value	Standard credit unit	Credit life	Regulatory liability
Voluntary carbon	\$29 million	tCO ₂ e	In perpetuity	<i>n/a</i>
Compliance carbon	\$63 million	tCO ₂ e	In perpetuity	Transfers to offset provider
Compliance wetland/stream markets	\$3.5 billion	Acre or linear foot, adjusted by an area-based ratio or functional measure	In perpetuity	Transfers to credit provider
Compliance/voluntary species/habitat markets	\$354 million	Acre, typically adjusted by an area-based ratio	Varies, typically in perpetuity	Transfers to credit provider
Compliance/voluntary water quality trading	\$30 million	Pound, Ton, MkCal/day	Varies, typically short-term	Remains with buyer

Sources: Hamrick, Kelley, and Melissa Gallant. 2017. *Fertile Ground: State of Forest Carbon Finance 2017*. Washington, DC: Forest Trends; Hamrick, Kelley, and Melissa Gallant. 2017. *Unlocking Potential: State of the Voluntary Carbon Markets 2017*. Washington, DC: Forest Trends; Bennett, Genevieve, Melissa Gallant, and Kerry ten Kate. 2017. *State of Biodiversity Mitigation 2017: Markets and Compensation for Global Infrastructure Development*. Washington DC: Forest Trends; and Bennett, Genevieve. *Alliances for Green Infrastructure: State of Watershed Investment 2016*. Washington DC: Forest Trends.

Summary of Lessons Learned on Demand and Implications for Water Quality Trading

In this section, we provide a summary of important recurring forces shaping demand and potential implications for water quality trading markets and nonpoint source pollution reduction incentives in the United States.

The Core Ingredients of Compliance Demand are Environmental Impact, Bad Alternatives, and Clear Regulatory Signals.

Across all markets, some fundamental conditions must be met for regulated entities to seek credits or offsets to meet their obligations. In short, demand requires:

Environmental impact + High cost/complexity of alternative compliance options + Predictable regulatory process

Environmental impact requires that a natural resource or ecosystem service/asset first of all be *present* in order to drive demand for credits or offsets; for example, the level of aquatic resources or presence of endangered species are key reasons for geographic variations in demand for wetland/stream compensatory mitigation or conservation credits.

One study of wetland mitigation found a positive relationship between the size of the mitigation need and demand for bank credits (BenDor and Brozovic 2007). One explanation is that permittees with larger impacts can achieve economies of scale by developing their own mitigation projects, but it is more cost-effective to purchase a bank credit for a minor impact. Mitigation bankers on the other hand have told Ecosystem Marketplace that regulators perpetuate this, "saving" bank credits for small impacts and encouraging permittees with larger impacts to use permittee-responsible mitigation (Bennett et al. 2017).

Ecosystem Marketplace analysis of voluntary carbon offsets demand has found organizations that voluntarily offset typically have a much larger Scope 3 emissions liability than their non-offset-purchasing peers (Goldstein 2016). Reducing Scope 1 (direct emissions) and Scope 2 (indirect emissions from electricity) is relatively simple:

wherever possible, companies can switch to cleaner fuels or install scrubbers to minimize direct emissions. Scope 3 emissions are trickier to reduce; since those emissions are controlled by other companies and organizations, most companies have limited control over emissions reductions activities. Voluntary buyers tend to come from sectors such as consumer goods, technology, and food and beverage, in which most of their emissions occur either upstream in the company's supply chain or downstream in the distribution or use of their goods and services. These emissions are difficult to address without completely rethinking supply channels or the life cycle emissions of products. Thus, while many climate-conscious companies consider how to reduce emissions in their supply chains, they purchase offsets in the meantime. Some companies have even begun to support and develop offset projects that directly benefit their supply-side operations (known as "insetting").

In addition to the simple presence of an impact requiring mitigation (and potentially a peripheral impact that is easier to address through a third-party solution), demand is also aided by conditions that make compliance alternatives very expensive or complicated. For example, California's conservation banking market is greatly aided by the fact that imperiled species co-occur with high rates of development and steep land prices. Expensive property values mean that developers have limited options in shifting development to another site and are motivated to move quickly through the permitting process.

Finally, clear signals from regulators in support of ecosystem credits or offsets as a compliance option and predictable processes and rules for this compliance path are critical. That topic will be discussed in the next section.

In Compliance Markets, Regulators are the Gatekeepers to Demand, in Terms of Both Market Design and Implementation/Interpretation of Market Rules.

The difference in offset usage in the two compliance carbon markets in the United States offers an illustrative example of the power held by regulators in shaping demand. Both markets incorporate offset trading as a cost containment mechanism and allow covered entities to use offsets to cover a certain amount of emissions reductions—3.3% in RGGI and 8% in California. However, while RGGI has been active since 2009, the first offsets weren't issued until 2017. In contrast, more than 87 MtCO₂e has been issued by California ARB, even though the California program started later than RGGI, in 2013.

Why is there such a discrepancy between markets? The short answer is allowance prices. If companies under RGGI can purchase allowances (essentially, permits to pollute) for less than an offset, they will continue to purchase allowances. RGGI has historically been plagued by over-allocation of allowances by market administrators, and subsequently has seen its allowances trading at prices much lower than the prices asked by offset projects. In contrast, many California allowances have sold at higher prices and several auctions have been sold out—driving buyers toward offsets when they are more cost-effective.

Regulators also have direct and indirect influence over demand given their role implementing and interpreting market rules. Variation in the level of market activity in wetland/stream mitigation banking and conservation banking across the United States illustrates this dynamic. Both can be explained in large part by significant regulatory discretion at the level of USACE districts overseeing wetland/stream compensatory mitigation and within USFWS field offices overseeing conservation banking and ILF programs.

Market adjustments throw supply and demand out of step in California

A key factor limiting transactions in the early years of the California market was the limited supply of offsets for sale. ARB allowed only a small number of offset protocols and took much longer than expected to verify early-action offsets for the compliance market.

The California market has picked up since then, with issuances (e.g., offsets approved for sale in the compliance market) hitting a record high in 2016. The volume of offsets issued to date exceeds demand for offsets in the California market: Ecosystem Marketplace has tracked 62.4 MtCO₂e in forestry offsets issued (California Air Resources Board 2018) compared to 18.7 MtCO₂e transacted since 2011 (Hamrick and Gallant 2017).⁷ Despite a plethora of offsets available, not all organizations are taking advantage of their 8% offset usage. In the first compliance period (2013-2014), regulated California companies surrendered 12.8M tCO₂e (46% of which were forestry-based). However, had compliance entities taken advantage of the full 8% that they were allowed to meet with offsets in this period, they would have surrendered roughly 25.7 MtCO₂e.

Supply is expected to contract again in the coming years, thanks to the 2017 decision by ARB to limit out-of-state offsets in the next phase of the cap-and-trade program. Under pressure from environmental justice advocates, beginning in 2021 the share of offsets allowed will drop from 8% to less than 4% of total compliance obligation, and at least half of offsets must come from projects "directly benefitting" California. This amount will then rise to 6% in 2026. Project developers tell Ecosystem Marketplace this will probably depress offset development in other US states. However, Québec's cap-and-trade program and Ontario's forthcoming program, which are both linked to California's market, are not expected to replicate California's reduced offset limits. Project developers hope those provinces will drive future demand for offsets (Weisberg 2017). Whether this will happen remains to be seen: in the past, the linking of California's market to Québec's resulted in increased demand for allowances, but not offsets (Walton 2017).

RGGI market management limits offsets demand

Demand for offsets has never existed within RGGI, since allowance prices in that market have historically remained too low to trigger demand for offsets in order to contain costs. The initial over-allocation of allowances by RGGI market administrators (a common pattern we've observed in cap-and-trade programs) resulted in low prices when the first compliance period began in 2009. Regular reviews over the years have provided an opportunity for market administrators to adjust the market cap and cost-containment provisions, checking price volatility and providing clear signals to allowance buyers and sellers.

Market forces and RGGI administrator interventions since 2009 have also hampered demand for offsets. In 2013, RGGI updated its "Model Rule," lowering the market cap to correct earlier over-allocation of allowances. A new Cost Containment Reserve eliminated the previous mechanism and instead set price thresholds at which additional allowances are released into the system. Allowance prices rose in response to the lower cap. As prices crept upward, the cost containment mechanism was triggered in both 2014 and 2015, which resulted in injections of additional allowances but still no demand for offsets. Then allowance prices began dropping in 2016, when it became clear that the USEPA Clean Power Plan wouldn't be implemented under the incoming Trump administration. Low allowance prices bode poorly for offset demand, but 2017 did finally see an offset issuance (for landfill methane, a cheap project type compared to forest and land-use offsets).

⁷ Actual transactions through 2016 are likely somewhat higher. We are aware that Ecosystem Marketplace's 2016 dataset is missing a major market participant's reporting, which means that transaction data is an underestimate of actual sales.

It is possible that the coming years could bring more interest in offsets within RGGI. The most recent program review kicked off in 2017, and while Model Rule amendments are still being finalized, administrators have announced that the market cap will be lowered 30% by 2020. Allowance prices have risen again in response—which may entice more offset project developers to enter the market in the future.

Regulatory discretion renders prioritization of mitigation banks only a “soft” preference

Despite growing recognition that well-designed and well-implemented third-party mitigation had benefits compared to permittee-responsible mitigation, the latter was still used by the majority of permittees well into the 2000s. In response, in 2008, USACE and USEPA issued a joint rulemaking establishing an explicit preference for third-party mitigation. The *Compensatory Mitigation for Losses of Aquatic Resources Final Rule* (often referred to as the “Final Rule”) declared that permittees should first seek mitigation bank credits where they were available, with ILFs and permittee-responsible mitigation coming in as second- and third-tier preferences. The Final Rule also harmonized standards for advance planning, implementation and management; emphasized a watershed approach to mitigation planning; and put in place strict timetables for USACE decisions on bank approvals (Department of the Army, Corps of Engineers, Department of Defense and Environmental Protection Agency 2008).⁸

The Rule began to shift demand toward third-party mitigation: the annual share of total wetland acreage mitigated through bank credits or ILFs grew from 25% in 2010 to over 40% of impacts by 2014 (United States Army Corps of Engineers 2018).⁹ But growth in demand driven by the Final Rule’s regulatory preference for third-party mitigation has actually been *slower* and less robust than bankers expected; some bullish market actors initially predicted a tripling of business (Kenny 2008). The primary reason is that regulators at the level of USACE district offices have significant discretion in interpreting and implementing the Final Rule.¹⁰ USACE staff have direct impact on demand in the degree to which they follow the 2008 Final Rule preference (which is only considered a “soft” preference by USACE) and through their policy on setting bank service areas (each USACE district has its own). Private wetland/stream mitigation banks have also said that agency referrals account for nearly 60% of their clients (Kaplowitz et al. 2008). Indirectly, regulators can also affect demand by facilitating, or throwing up barriers to, supplier market entry through levers like the timeline for project approval, performance standards, and credit release schedules.

Conservation banking finds a regulatory champion in the Golden State

In contrast to wetland/stream compensatory mitigation, the ESA lacks the regulatory clarity of the CWA in terms of the obligation to mitigate for negative residual impacts. This means that, ultimately, demand for third-party species/habitat mitigation depends on field office staff enforcement. California—home of incredible biodiversity, lots of development, and shocking property values—embraced conservation banking early. The California DFW released conservation banking guidance a decade before it was available at the federal level, and strong

⁸ Department of the Army, Corps of Engineers, Department of Defense and Environmental Protection Agency. 2008. “Compensatory Mitigation for Losses of Aquatic Resources; Final Rule.” 73 Federal Register No. 70 (April 10): pp. 19594–19705.

⁹ This did not, however, translate into a big jump in demand in terms of absolute volume or value of transactions, due to the “Great Recession” in 2007–2012 which saw development—and thus demand for compensatory mitigation—crumple. Mitigation bankers initially pinned their hopes on a federal stimulus package to shore up demand as private buyers evaporated. But the majority of infrastructure stimulus dollars were ultimately earmarked for “shovel-ready” projects (e.g., already permitted or in an advance stage of permitting), which created little *new* demand for compensatory mitigation.

¹⁰ Regulatory discretion at the local/regional level of course also has benefits: regulators are afforded flexibility in deciding how best to implement and enforce natural resource protections depending on local conditions.

regulatory familiarity at DFW with conservation banking means that banking agreements are more likely to be approved and approved faster. That history has created greater certainty among potential buyers of conservation bank credits. Meanwhile field offices in many other parts of the country have been slower to use third-party mitigation or have only used it in the case of large impacts (Kormos et al. 2015). This is not to say that there is a bias *against* third-party mitigation; a USFWS survey of its regulators found that conservation banking is generally viewed positively across the Service (Department of Interior Office of Policy and Analysis 2013). But the mechanism seems to require committed champions among regulatory staff to gain traction, in addition to the core demand drivers discussed in the previous paragraph.

Early On, Virtually All Markets Struggle with Buyer Perceptions that the Mechanism Is Risky—Sometimes Reinforced by Initial Mistakes by Market Administrators. If Buyers See Changes as Course-Correction Rather Than a Crisis, Confidence in The Market Can Be Maintained.

Early voluntary carbon offsets “Wild West” leads to recognition of the need for standards

When voluntary offset trading first took off, most project developers adhered to their own internal metrics to measure and create their own offsets. This led to wide variation around offset quality and also allowed for unscrupulous individuals to market projects that did not have any positive impact on the environment. For instance, in 2007, Vatican City purchased forestry offsets to become “the first carbon-neutral state,” but several years later no trees had been planted (Struck 2010). In another example, an Australian real estate developer attempted to swindle isolated Peruvian indigenous communities into signing away the rights to their land under the guise of developing carbon offsets, with the true intention of logging the land and planting a palm oil plantation (Jacobs 2013).

These so-called “carbon cowboys” were and still are the exception, not the rule, in the carbon offsetting industry. Still, coverage of these incidents reached mainstream new outlets like *The Atlantic* (Jacobs 2013) and *Harpers Weekly* (Schapiro 2010). As a result, especially in the formative years of the market, the actions of a few bad apples affected the public’s perception of the industry as a whole (Zwick 2013). However, with many other factors at play it is hard to measure exactly how much these incidents affected overall demand for carbon offsets.

In response to these scandals, and as the market matured, voluntary market actors developed a number of mechanisms to police themselves. Standard bodies including the Verified Carbon Standard, American Carbon Registry, and the Gold Standard began standardizing carbon accounting methodologies and requiring third-party verification. Registries like Markit and APX began tracking offsets from issuance through retirement, preventing double-counting.

California confidence on the rebound

Demand for forestry and land-use offsets in the California compliance market was slow to take off in its early years. One contributing factor was the shifting liability around forest carbon offsets; another was initial uncertainty over the circumstances under which ARB might invalidate offsets, i.e., ruling offsets ineligible for compliance and requiring their owners to come up with replacement offsets.

Under the initial ARB market design, buyers assumed liability for offsets that failed to meet compliance standards—except in the case of forest offsets, where forest carbon project developers were responsible for the risk of invalidation, even after selling offsets to buyers. In April 2014, amendments to California cap-and-trade

rules brought forestry projects in line with other project protocols, settling that issue. After that point, buyers were liable for all offset types sold.

The market has responded to address the risk of invalidation. An average offset approved by ARB has an invalidation risk for eight years after issuance. These have been dubbed “CCO8s.” However, if a project developer submits a project to a second verification by a different third-party, the resulting offsets have an invalidation risk of only three years (called “CCO3s”). Finally, there are also “Golden CCOs,” which are backed by a promise to the buyer to replace any offsets invalidated by the ARB at no extra cost.

Initially, market participants were uncertain about how egregious a violation must be and what would constitute a violation rising to the level of ARB actually invalidating offsets. The issue came to a head in the latter half of 2014 during a five-month investigation of an Arkansas facility producing ozone-depleting substances offsets. There were no problems with the offsets themselves, but the facility for a period of time had been operating out of compliance with a federal permit. Ultimately, ARB invalidated 85,955 offsets; a large amount concerning the infraction had nothing to do with the offset quality itself. This represented less than 1% of total offsets on the market, but was a blow to a number of buyers since ozone-depleting substances offsets were the preferred project type for pre-compliance purchasers who considered those offsets at lower risk of invalidation. During the investigation, overall trading of offsets in the California market dropped substantially (Goldstein 2015).

By the first compliance period of the California market (2013-2014), total transactions for offsets had fallen far short of what was permitted by the market, as noted above. Project developers attributed underperformance to the specter of invalidation continuing to haunt California’s market.

Regulators nip the liability question in the bud

Mitigation banking and ILFs first emerged in the 1990s but were initially slow to take off; most developers (and the regulators they worked with) preferred permittee-responsible mitigation. Banks in particular were seen as complex and risky. An important step in addressing buyer questions about the use of third-party mitigation was the establishment of the precedent that regulatory liability is transferred from the buyer to the ILF program or mitigation bank along with the mitigation payment (Shabman and Scodari 2004). USACE guidance on mitigation banking issued in 1995 constituted an additional nod of approval by regulatory authorities of third-party mitigation that helped to settle buyers’ nerves (Federal Guidance for the Establishment, Use and Operation of Mitigation Banks Notice 1995).

In Compliance Markets, the Public Sector May Have the Advantage in Predicting Demand.

North Carolina Division of Mitigation Services matches risks to strengths

The public sector controls not just regulatory drivers of ecosystem markets but often a large share of demand too (such as from public infrastructure projects requiring compensatory mitigation). In North Carolina, the Department of Transportation (NCDOT) plans out highway construction projects seven years in advance, including predicted wetland impacts. Beginning in 2001, NCDOT began working with the state Department of Environment and Natural Resources, USACE, and ten other state and federal agencies to find ways to proactively meet mitigation needs. The resulting DMS (formerly called the Ecosystem Enhancement Program) acts as a hybrid ILF/credit purchaser and reseller. NCDOT and other buyers pay in-lieu fees into the program, and DMS uses those funds to contract with private companies to deliver advance mitigation for projects (through either a full-service

delivery model or purchasing credits from mitigation banks). Suppliers are contracted through periodic requests for proposals (RFPs) based on projected future mitigation needs.

The model has been successful in ensuring demand, because it shifts demand risk to the public sector, lowers transaction costs and credit costs, and makes permitting more predictable for buyers. It matches risks to strengths: the private sector carries implementation risk and most of the financing risk (though NCDOT provided initial program capital), while the public sector takes on the burden of accurately predicting demand and ensuring a pipeline of approved credits.

Compliance Buyers Consider Predictability and Simplicity Along with Cost.

Oregon sets up offsets as the easy option

Oregon's Carbon Dioxide Standard provides another approach to carbon pricing, and one that has resulted in steady demand for offsets. Rather than issuing allowances under a cap-and-trade program, the Carbon Dioxide Standard requires new power plants to reduce their carbon dioxide emissions onsite, develop emissions reduction projects offsite (i.e., create their own offsets), or fund emissions reduction projects carried out by a state-recognized nonprofit. At present, only one nonprofit provides this service, the Climate Trust. To date, *all* new plants have chosen to source offsets through the Climate Trust through the payment of a simple fee.

Buyers may be more comfortable paying a fee than buying a credit

In a survey of energy companies regarding demand for greater sage-grouse compensatory mitigation, the majority of potential buyers preferred an ILF instrument to conservation banking, apparently because they had experience with ILFs in other contexts and they liked the idea of cost certainty (Pearman and Plawecki 2015). (This was a very small sample, however.)

The survey authors suggested this may be partly a product of familiarity with ILFs, since the Lesser Prairie-Chicken Range-wide Conservation Plan uses an ILF mechanism, and note that the design and implementation characteristics companies preferred could be offered by either a bank or ILF program. For example, depending on market design there is no reason a bank credit could not provide mitigation cost certainty similar to an ILF program. (Potential sage-grouse credit buyers may have also noted that the ILF program for the lesser prairie-chicken offers mitigation much more cheaply than prices reported to Ecosystem Marketplace by competing mitigation banks.)

North Carolina's Division of Mitigation Services (DMS) follows this logic of providing cost certainty, using a fee structure on the front end with buyers, which it uses to purchase wetland, stream, riparian buffer, and nutrient mitigation credits from project developers.

Regulatory Uncertainty Can Be Tenacious.

The limits of non-legislative fixes

Over the years, uncertainty over the precise scope of regulatory jurisdiction over aquatic resources has also interfered with demand for compensatory mitigation. In 2001, the *Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers* decision that USACE did not have jurisdiction over hydrologically isolated wetlands on the basis of the so-called "migratory bird rule" was blamed by project developers for demand falling by as much as 50% in the Chicago area (Hook and Shadle 2013). The *Rapanos v. United States* Supreme Court decision that followed in 2006, in attempting to clarify the CWA's jurisdiction, resulted in even greater overall confusion (Kenny 2006). An internal memo from USEPA Assistant Administrator for Enforcement Granta Nkayam

said *Rapanos* “negatively affected approximately 500 enforcement cases.” Agencies, the memo said, either declined to pursue enforcement or lowered its priority. Bankers reported that in some states permitting was taking “twice as long” (Kenny 2008).

At the heart of the debate is what constitutes “waters of the United States” (WOTUS) that are subject to regulation under the CWA. Rather than clarifying this issue through the legislative process, the bounds of the CWA permitting program have been repeatedly redrawn through court rulings, executive orders, rulemaking, and guidance (Shabman and Scodari 2004). Following *Rapanos*, USACE and USEPA released new guidance attempting to provide clarity on CWA jurisdiction in 2008, which had the unusual outcome of uniting developers, environmentalists, and wetland bankers in their disparagement of the document (Kenny 2008). New draft guidance was issued again in 2011, followed by a draft rule released in 2014, which was met by strong opposition from legislators, agriculture, energy, and property development interests perceiving an expansion of federal jurisdiction, although USEPA and USACE maintained the rule was intended only to clarify the WOTUS question. Hours before the rule was due to go into effect in 2015, a federal judge in North Dakota issued a temporary injunction halting implementation in 13 states. Next, President Trump in February 2017 signed an executive order calling on USACE and USEPA to review the rule and either rescind or revise it. As of January 2018, USACE and USEPA intend to carry out the Executive Order through a two-step process, first recodifying regulations that existed prior to the 2015 Clean Water Rule, and then proposing a new definition of WOTUS. But the issue of CWA jurisdiction is unlikely to be put to bed any time soon, which means that a measure of uncertainty remains surrounding the primary demand driver of wetland and stream compensatory mitigation.¹¹

Voluntary and Pre-Compliance Demand Has a Mixed Track Record.

Preparation for regulation

Voluntary demand has historically peaked in expectation of a move to compliance markets. The CCX was established in 2003 in anticipation of a nationwide cap-and-trade program in the United States. When the Senate failed to take up a cap-and-trade bill in 2010, offset prices dropped precipitously, and the market crashed. In 2011 and 2012, voluntary activity began to recover, buoyed by pre-compliance sales prior to the start of the California carbon cap-and-trade program. Once the compliance program launched in 2013, voluntary markets contracted again.

Growing sophistication, but purely voluntary demand cyclical

Outside of pre-compliance, voluntary markets ultimately have relied on corporate CSR-driven buyers. The most common CSR motivations reported to Ecosystem Marketplace in 2016 were to demonstrate climate leadership; to achieve internal GHG reduction targets; to pursue a climate-driven mission; to engage customers/clients to offset emissions associated with their purchase(s); and to establish a sustainable supply chain. Because of these motivations, voluntary CSR-driven demand is often sensitive to broad economic pressures. During an economic contraction or recession, discretionary spending on CSR is likely to fall, as was the case in 2008-2010. Voluntary buyers’ interests may shift over time, too; since 2014, project developers report declining interest in offsets from longtime CSR buyers.

Many CSR-driven offset purchasers are “bargain” buyers, seeking to meet their quantitative commitments with whatever is cheapest (often methane offsets in the United States). But Ecosystem Marketplace has also found

¹¹ To be clear, it is highly unlikely that this demand driver will cease to exist entirely. At stake is the curtailment of the scope of aquatic resources where impacts would require compensatory mitigation or potentially the degree of enforcement of CWA permitting authority.

that voluntary carbon offsets buyers have grown more and more sophisticated over the past decade in terms of their motives for offset purchases and the offset characteristics they require. “Boutique” buyers want a great story and often co-benefits for communities/biodiversity/water. These buyers often come from sectors where brand management is important, such as consumer goods. In theory, these needs translate into a willingness to pay more for charismatic project types, such as forestry projects. However, some longtime voluntary buyers have started to realize their negotiating power in a market with lots of supply and inadequate demand; project developers say that returning customers—even the “boutique” buyers—have begun to try to negotiate lower prices.

New voluntary carbon offset buyers typically start small in their initial purchases. But the voluntary markets have seen relatively little demand coming from new buyers in recent years. In 2016, we tracked 30% of transactions coming from new buyers—however, these buyers only purchased 6% of carbon offsets on the voluntary market (Hamrick and Gallant 2017b).

Conservation crediting seeks to tap pre-compliance buyers

Project developers in the species/habitat markets have looked to expand the pool of demand by positioning third-party mitigation as a solution to problems beyond endangered species, including as a conservation strategy for candidate species. The Department of Defense supported a habitat credit exchange for the golden-cheeked warbler to mitigate Fort Hood’s impacts, which were quite clearly growing. The need to train troops for deployment to Iraq and Afghanistan contributed to a sense of urgency.

Using banking or an ILF mechanism for candidate species has also had some initial success for the lesser prairie-chicken and greater sage-grouse. In the case of the lesser prairie-chicken, rapidly declining population numbers added to a sense of impending ESA listing among energy companies active in the lesser prairie-chicken’s range. In 2015, a consortium of energy companies and nonprofit organizations in collaboration with the Western Association of Fish and Wildlife Agencies (WAFWA) created the Lesser Prairie-Chicken Range-wide Conservation Plan to proactively conserve habitat, mitigate species loss, and preclude listing under the ESA. The plan relies on a large ILF mechanism which has accepted \$4.1M in mitigation fees as of 2016 (Wolfe et al. 2016).

The greater sage-grouse has also been the subject of efforts to use third-party mitigation as part of broader conservation efforts to preclude ESA listing. In 2015, Barrick Gold Corporation, USFWS, the Nature Conservancy, and the Bureau of Land Management signed a deal to establish a conservation bank in Nevada developing greater sage-grouse habitat credits for Barrick Gold. A second conservation bank, the Sweetwater River Conservancy (later acquired by Sammons Enterprises and renamed Pathfinder Ranches) was established in Wyoming the same month. Pre-compliance efforts appear to have paid off: six months later after the two banks were established, USFWS announced its decision that a listing status under the ESA for the grouse was not warranted.

All of this adds up to a very small total sum of experience to date in attracting demand for candidate species credits. The fact that a few transactions have taken place suggests that it is possible to engage buyers on the basis of staving off future regulation, although that basis is probably extremely limited.¹² Ultimately, pre-compliance demand requires a predictable and clear regulatory path toward a compliance regime and appealing third-party mitigation options in terms of cost certainty and regulatory support. One small survey of five energy companies assessing interest in greater sage-grouse credits showed that the industry was inclined to wait for a listing

¹² Of course, from a regulatory and conservation point of view, pre-compliance action to develop voluntary conservation strategies and voluntary market supply/infrastructure can be very positive for a species even if little demand ever materializes.

decision, new state regulations, and/or updated resource management plans clarifying their obligations (Pearman and Plawecki 2015).

Ultimately, history suggests that pre-compliance demand for species/habitat credits is very weak. Uncertainty around the direction of federal mitigation approaches under the Trump administration is unlikely to help (Richards 2017).

An Industry Association Can Be A Very Effective Force in Lobbying for Regulatory or Market Rules That Create New Demand.

ERBA: A longstanding mitigation industry crusader

In 1998, mitigation bankers organized an industry association, the National Mitigation Banking Association (NMBA), later rebranded as the Ecological Restoration Business Association (ERBA),¹³ to advocate for policy and regulation supportive of banking. A key item on ERBA's early agenda was to address the perception that banking was a risky or lower-quality form of mitigation. Their efforts were aided by a 2001 National Research Council study finding that third-party mitigation offered advantages over permittee-responsible mitigation, particularly where advance mitigation, long-term stewardship assurances, and a watershed focus were implemented (National Research Council 2001). The Society of Wetland Scientists also supported mitigation banking in a position statement in 2007, noting that banks were more likely than other mitigation types to restore large contiguous wetlands with high ecological values on the landscape (Society of Wetland Scientists 2007). These endorsements were frequently cited in the early years by ERBA's members as objective, science-driven evidence in favor of banking. In more recent years, bankers' marketing strategies have turned the perception of riskiness on its head, emphasizing low regulatory risk (and thus also cost predictability and low risk of reputational damages in case of project failure) as a selling point *in favor of* bank credits over permittee-responsible mitigation, and positioning bankers as experts that can lead clients through complex permitting.

ERBA's lobbying was instrumental in getting the 2008 Final Rule in place, which recognized wetland mitigation banking as a lower-risk form of mitigation (a key topic of ERBA advocacy efforts) and established regulatory preference for banking over ILF and permittee-responsible mitigation. ERBA employs an Executive Director and a lobbyist, funded by membership dues, and provides members with resources and talking points for lobbying their own Congressional representatives.

Many project developers in the wetland/stream mitigation field also market conservation bank credits and have served over the years on the ERBA board. These project developers have focused some of their lobbying efforts on making the species/habitat credit sector more like wetland/stream compensatory mitigation, particularly with regards to a regulatory preference for advance mitigation and for banking over other types of mitigation. A partial victory came in late 2016 when USFWS published its Compensatory Mitigation Policy. The new policy borrows many tenets of wetland/stream compensatory mitigation, including an explicit preference for advance mitigation, and a stated goal of "no net loss" or "net gain" for protected species. However, banks were not identified as a first

¹³ Formerly the National Mitigation Banking Association (NMBA). In 2017, NMBA rebranded as ERBA and a number of members split off to form their own industry association, focused specifically on mitigation banking, known as the National Environmental Banking Association (NEBA). See: Barrett, Kelli. 2017. "Big Mitigation Bankers Embrace Role As 'Ecological Restoration Businesses', But Smaller Players Feel Sidelined." Ecosystem Marketplace, June 7. <http://www.ecosystemmarketplace.com/articles/big-mitigation-bankers-embrace-role-ecological-restoration-businesses-smaller-players-feel-sidelined/>.

choice, and, with the arrival of the Trump administration a month later in January 2017, the new policy's future is unclear. The policy hasn't yet resulted in any appreciable growth in demand.

CODA quieter on industry promotion; focusing instead on technical issues

Project developers focused on the California cap-and-trade program have an industry association, the Compliance Offsets Developers Association (CODA), which consists of the six largest carbon offset developers serving the market. CODA works on engaging regulators and market administrators on procedural and technical issues, rather than lobbying or political advocacy, and has played a relatively quiet (but effective) role in market evolution to date (Clayton 2013). The association has submitted coordinated comments to ARB on several occasions on amendments to the cap-and-trade program, including proposed changes for the 2021-2030 period and on topics like invalidation (Compliance Offset Developers Association 2016a, Compliance Offset Developers Association 2016b). But CODA has not had the visibility of other associations like ERBA or the International Emissions Trading Association, which promotes compliance and voluntary carbon market mechanisms globally). There is strong opposition to offsets—particularly to non-California offsets—among environmental justice groups in California, and CODA may well have concluded its efforts were better spent focusing more narrowly on market design issues and maintaining a low public profile.

Conclusions for Stimulating Demand in Water Quality Markets

First and foremost, demand is more likely to emerge where serious water quality challenges exist, alternative compliance options are very costly or complex, and buyers are confident that regulators support trading.¹⁴

Regulators have the ability to fundamentally shape demand. This is particularly true for water quality trading, where trading program rules and market infrastructure are developed at the state or local level and thus will vary far more than CWA §404 or ESA-driven programs. Identifying champions and targeting NNWQT resources to support them is one response; another is to recognize that some degree of regulatory discretion can actually be beneficial. It allows regulators flexibility to create or tailor methodologies, guidance, templates, and standard operating procedures in order to improve regulatory efficiency or effectiveness. At the same time, the history of implementation of the Final Rule suggests that institutional organization and culture can be an important limit to the power of high-level federal rulemaking or guidance: much still depends on attitudes at the local field office.

Market administrators should develop a very clear understanding of sources of regulatory risk and other threats to buyer confidence within their market. Understanding the issues that have historically bedeviled other markets can also help water quality trading program designers to avoid repeating those mistakes. Trading program administrators can identify specific potential threats to buyer confidence, and try to create a flexible system that allows them to respond to future events. Since mistakes are virtually inevitable, starting small and scaling up can limit the significance of early problems. A predictable, transparent process for reviewing program performance and making changes can also build trust in the market.

The question of whether regulatory liability for water quality impairment can transfer from a buyer to the credit or offset provider is critical. Liability was a pivotal issue in the past in carbon and wetland/stream markets, and

¹⁴ The question of impact size is an interesting one when it comes to water quality. Are wastewater treatment plants and other point sources more likely to pursue credit trading for relatively incremental improvements, rather than as the core of their pollutant reduction strategy? This may be the case, but small transaction sizes may also result in very high transaction costs, stifling demand. Additional research into the history of trading and the relationship between deal size and robustness of demand might be useful.

one that market administrators needed to address before significant demand could emerge. At present in water quality trading markets, mechanisms exist to transfer financial liability for a credit, but not regulatory liability. Whether this is a deal-breaker for buyers, and how compliance risk might be further mitigated, is a critical question for further investigation.

If challenges to a market's legal status do arise, market administrators may want to settle in for the long haul. Litigation resulting in court decisions can sometimes be clarifying; other times (as with *Rapanos v. United States*) a court decision can simply add to the mess. Likewise, memoranda, guidance, and rulemaking are all subject to reversals, reinterpretation, and endless revisions.

Think about the front-end experience for buyers. Are there ways to simplify the transaction or make the process or costs extremely predictable? A credit trading program is not the only delivery mechanism for polluters to fund water quality improvements, and indeed in some cases it may be overly complex from the point of view of potential buyers. Market designers should also understand the specific priorities of their potential buyers, whether it is cost certainty, speed, minimizing burdens on their employees, or something else.

Many buyers of water quality credits come from the public sector, where it may be possible to project demand well into the future. Market administrators might consider how to design a program that provides good demand certainty for suppliers and cost certainty for buyers, whether through purchase or price guarantees, RFPs for credits/full service delivery, or some other mechanism.

Like species/habitat markets, pre-compliance action in anticipation of a forthcoming Total Maximum Daily Load has not always panned out for water quality trading programs. While it is an opportunity worth considering, market administrators may want to limit resources invested until regulation is clearly forthcoming. And in that event, market administrators should expect voluntary markets to contract as demand migrates to the compliance space, and take steps to help suppliers migrate too, so projects are not stranded.

Some buyers are simply seeking the lowest cost. But for others, local co-benefits and a good story can be extremely compelling and even tip the balance in favor of trading that is not cost-competitive with other compliance options. The “bargain and boutique” dynamics seen in voluntary carbon offsets markets exist in compliance markets as well. It may be possible to hook onto recent utility interest in the concept of the “Utility of the Future”, which emphasizes new technologies and innovative approaches in pursuit of resource recovery, efficiency and sustainability, and the appeal of greater community and watershed-level engagement in making a case for nonpoint source improvements.

Strong and consistent engagement on behalf of market mechanisms is important given the regulatory nature of water quality markets. The different strategies of ERBA and CODA are instructive: whereas ERBA has focused on lobbying and advocacy, CODA has explicitly avoided politics in favor of influencing procedural and technical issues. While policy and rulemaking advocated by ERBA have increasingly driven buyers toward wetland/stream mitigation banking, in the more politically fraught environment of California, CODA has not made demand stimulation a core objective. This is not to discount the value of an industry speaking with one voice on technical and procedural issues or focusing on providing tools and information to its members—but only to point out these activities don't necessarily help to build demand.

References

- Barrett, Kelli. 2013. "FWS Revises Rule on Lesser Prairie Chicken Conservation to Include WAFWA Plan." Ecosystem Marketplace, December 16.
- Barrett, Kelli. 2014. "Should Landowners Earn Biodiversity Offsets For Conserving Species Habitat Before It Becomes Endangered?" Ecosystem Marketplace, August 19. <http://www.ecosystemmarketplace.com/articles/should-landowners-earn-biodiversity-offsets-for-conserving-species-habitat-before-it-becomes-endangered/>
- Barrett, Kelli. 2017. "Why the big mitigation bankers are embracing ecological restoration." GreenBiz, August 24. <https://www.greenbiz.com/article/why-big-mitigation-bankers-are-embracing-ecological-restoration>
- Barrett, Kelli. 2015. "Fight Over Declining Bird Highlights Debate Over Role Of Permanence In Mitigation." Ecosystem Marketplace, March 24. <http://www.ecosystemmarketplace.com/articles/fight-over-declining-bird-highlights-debate-over-role-of-permanence-in-mitigation/>
- Barrett, Kelli. 2015. "New Conservation Bank Aims To Save the Roaming Sage-Grouse." Ecosystem Marketplace, June 29. <http://www.ecosystemmarketplace.com/articles/new-conservation-bank-aims-br-to-save-the-roaming-sage-grouse/>
- Barrett, Kelli. 2013. "Can Conservation Banking Save the Prairie Chicken?" Ecosystem Marketplace, December 4. <http://www.ecosystemmarketplace.com/articles/can-conservation-banking-save-the-prairie-chicken/>
- BenDor, T. K., Riggsbee, J. A., & Doyle, M. (2011). Risk and markets for ecosystem services. *Environmental Science & Technology*, 45(24), 10322.
- BenDor, T., & Brozovic, N. (2007). Determinants of spatial and temporal patterns in compensatory wetland mitigation. *Environmental Management*, 40(3), 349-64.
- BenDor, Todd, J. Adam Riggsbee, and George Howard. 2009. "Mitigation Bankers Say New Rule Heightens Old Conflicts: Survey." Ecosystem Marketplace, November 20. <http://www.ecosystemmarketplace.com/articles/mitigation-bankers-say-new-rule-heightens-old-conflicts-survey/>
- Bennett, Genevieve, Melissa Gallant, and Kerry ten Kate. 2017. *State of Biodiversity Mitigation 2017: Markets and Compensation for Global Infrastructure Development*. Washington DC: Forest Trends.
- Bernard, H. Russell. 2000. *Social Research Methods: Qualitative and Quantitative Approaches*. London; Thousand Oaks: SAGE.
- Best, Constance. "Forest Carbon Offsets Market Comes of Age: Lessons from California's Landmark Climate Action Program." Presentation, ACES Conference, Washington DC, December 2014.
- Burgert, Phil. 2008. "RGGI Results Due Monday: Are Regional Initiatives Ushering in the Forestry Age?" Ecosystem Marketplace, September 15. <http://www.ecosystemmarketplace.com/articles/rggi-results-due-monday-are-regional-initiatives-ushering-in-the-forestry-age/>
- Burgert, Phil. 2008. "California Flirts with Regulatory Standards on Voluntary Carbon Offsets." Ecosystem Marketplace, May 31. <http://www.ecosystemmarketplace.com/articles/california-flirts-with-regulatory-standards-on-voluntary-carbon-offsets/>
- C2ES. n.d. California Cap and Trade. Center for Climate and Energy Solutions. <https://www.c2es.org/content/california-cap-and-trade/>
- C2ES. n.d. Regional Greenhouse Gas Initiative (RGGI). Center for Climate and Energy Solutions. <https://www.c2es.org/content/regional-greenhouse-gas-initiative-rggi/>
- California Air Resources Board. 2018. "Compliance Offset Program." *California Air Resources Board*, Government of California, January 10. www.arb.ca.gov/cc/capandtrade/offsets/offsets.htm
- Clayton, Taylor. 2013. "New Compliance Association Unites California Offset Project Developers." Ecosystem Marketplace, July 1. <http://www.ecosystemmarketplace.com/articles/new-compliance-association-unites-california-offset-project-developers/>

- Compliance Offset Developers Association. 2016a. "Amendments to the California Cap and Trade Program." Climate Change Program, California Air Resources Board, March 11. <https://www.arb.ca.gov/lists/com-attach/21-mrr-cpp-ct-amend-ws-UTIBaFI3AjBWD1Q3.pdf>
- Compliance Offset Developers Association. 2016b. "Amendments to the California Cap and Trade Program." Climate Change Program, California Air Resources Board, September 19. <https://www.arb.ca.gov/lists/com-attach/33-capandtrade16-AGMAaV04VmRRCAVm.pdf>
- Davies, Susan. n.d. "Presentation: Wetland/Stream and Conservation Banking in the US: An Illustration of Biodiversity Offsets Driven by Regulation" and "Transcript of the Debate," in: Biodiversity Offsetting & Habitat Banking for Scotland: Notes from the workshop. Edinburgh Centre for Carbon Innovation.
- Department of the Army, Corps of Engineers, Department of Defense and Environmental Protection Agency. 2008. "Compensatory Mitigation for Losses of Aquatic Resources; Final Rule." 73 Federal Register No. 70 (April 10): pp. 19594–19705.
- Derby, Justin. 2009. "How the Recession Is Altering the Mitigation Banking Landscape." Ecosystem Marketplace, July 9. <http://www.ecosystemmarketplace.com/articles/how-the-recession-is-altering-the-mitigation-banking-landscape/>
- Diaz, David. 2010. "California Moves Carbon Offset Goalposts." Ecosystem Marketplace, March 3. <http://www.ecosystemmarketplace.com/articles/california-moves-carbon-offset-goalposts/>
- DOI Office of Policy and Analysis. 2013. *A Preliminary Analysis of the Conservation Banking Program and Results from a Survey of USFWS Staff*. Washington DC: Department of Interior. https://www.fws.gov/endangered/landowners/pdf/CB%20Report%20DOI_Final_Sept2013.pdf
- DOI Office of Policy Analysis. 2016. *Results from a Survey of Conservation Banking Sponsors and Managers*. Washington DC: Department of Interior.
- Dormady, N. C., & Englander, G. 2016. Carbon allowances and the demand for offsets: A comprehensive assessment of imperfect substitutes. *Journal of Public Policy*, 36(1), 139-167.
- Environmental Law Institute. 2013. *State Constraints: State-Imposed Limitations on the Authority of Agencies to Regulate Waters beyond the Scope of the Federal Clean Water Act*. ELI. <https://www.eli.org/research-report/state-constraints-state-imposed-limitations-authority-agencies-regulate-waters>
- Ernst, Sieren. 2013. "RGGI Still Falls Short of Real Carbon Pricing." The Energy Collective, May 14. <http://www.theenergycollective.com/sierenernst/223966/reformed-rggi-still-falls-short-real-carbon-pricing>
- Federal Guidance for the Establishment, Use and Operation of Mitigation Banks; Notice*. Federal Register 60(228): 58605, Nov. 28, 1995.
- Forest Trends' Ecosystem Marketplace. 2018. "Our Publications." Forest Trends. <http://www.ecosystemmarketplace.com/publications/>
- Goldstein, Allie and Franziska Ruef. 2016. *View from the Understory: State of Forest Carbon Finance 2016*. Washington DC: Forest Trends.
- Goldstein, Allie. 2015. "California Offset Market Slow to Ramp up." Ecosystem Marketplace, February 26 Retrieved from <http://www.ecosystemmarketplace.com/articles/california-offset-market-slow-ramp/>
- Goldstein, Allie. 2014. "Voluntary Carbon Market Stalls, But Buyers See Silver Lining." Ecosystem Marketplace, June 26. <http://www.ecosystemmarketplace.com/articles/voluntary-carbon-market-stalls-but-buyers-see-silver-lining/>
- Gonzalez, Gloria, and Ben McCarthy. 2014. "US EPA Gives Major Boost To Cap-And-Trade, But Not Offsets." Ecosystem Marketplace, June 2. <http://www.ecosystemmarketplace.com/articles/us-epa-gives-major-boost-to-cap-and-trade-but-not-offsets/>
- Gonzalez, Gloria. 2014. "Quebec's Carbon Market Rebounds after California Hook Up." Ecosystem Marketplace, March 10. <http://www.ecosystemmarketplace.com/articles/quebecs-carbon-market-rebounds-california-hook/>

- Gonzalez, Gloria. 2013. "In Warsaw as In California, Forest Carbon Carrot Needs Compliance Stick." Ecosystem Marketplace, November 11. <http://www.ecosystemmarketplace.com/articles/in-warsaw-as-in-california-forest-carbon-carrot-needs-compliance-stick/>
- Gonzalez, Gloria. 2013. "Disney To Expand Voluntary Carbon Offset Buying." Ecosystem Marketplace, September 13. <http://www.ecosystemmarketplace.com/articles/disney-to-expand-br-voluntary-carbon-offset-buying/>
- Gonzalez, Gloria. 2014. "Despite Market Outcry, California Voids Some Carbon Offsets." Ecosystem Marketplace, November 14. <http://www.ecosystemmarketplace.com/articles/despite-market-outcrycalifornia-voids-carbon-offsets/>
- Gonzalez, Gloria. 2014. "Forest, Ag Project Developers See Opportunity, Concern in California ODS Offset Invalidation." Forest Carbon Portal, November 17. <http://www.forestcarbonportal.com/news/forest-ag-project-developers-see-opportunity-concern-in-california-ods-offset-invalidation>
- Gonzalez, Gloria. 2015. "Invalidation Risk Still Shadows California Offsets Market." Ecosystem Marketplace, May 18. <http://www.ecosystemmarketplace.com/articles/invalidation-risk-still-shadows-california-offsets-market/>
- Gonzalez, Gloria. 2014. "Chevrolet: Driving In the Voluntary Carbon Market's Fast Lane." Ecosystem Marketplace, May 19. <http://www.ecosystemmarketplace.com/articles/chevrolet-driving-in-the-voluntary-carbon-market-s-fast-lane/>
- Gonzalez, Gloria. "Early Action: Not So Fast In California Offsets Program." Ecosystem Marketplace, May 19. <http://www.ecosystemmarketplace.com/articles/early-action-not-so-fast-in-california-offsets-program/>
- Gonzalez, Gloria. 2013. "California Puts Rice Cultivation Protocol on Ice." Ecosystem Marketplace, August 20. <http://www.ecosystemmarketplace.com/articles/california-puts-rice-cultivation-br-protocol-on-ice/>
- Gonzalez, Gloria. 2014. "The BioCarbon Group: Playing Both Sides." Ecosystem Marketplace, May 21. <http://www.ecosystemmarketplace.com/articles/the-biocarbon-group-playing-both-sides>
- Gonzalez, Gloria. 2014. "California Regulators Bump Rice Offsets, Forestry Updates To 2015." Ecosystem Marketplace, December 23. <http://www.ecosystemmarketplace.com/articles/california-regulators-bump-rice-offsets-forestry-updates-2015/>
- Hamrick, Kelley, and Melissa Gallant. 2017a. *Fertile Ground: State of Forest Carbon Finance 2017*. Washington, DC: Forest Trends.
- Hamrick, Kelley, and Melissa Gallant. 2017b. *Unlocking Potential: State of the Voluntary Carbon Markets 2017*. Washington, DC: Forest Trends.
- Hook, Patrick W., and Spenser T. Shadle. 2013. "Navigating wetland mitigation markets: A study of risks facing entrepreneurs and regulators." Ecosystem Marketplace, Washington, DC.
- Howard, George. 2012. "Challenges to Eco-Markets: A Veteran Speaks." Presentation, ACES Conference, Ft Lauderdale FL, December.
- Institute for Water Resources. 2015. *The Mitigation Rule Retrospective: A Review of the 2008 Regulations Governing Compensatory Mitigation for Losses of Aquatic Resources*. Alexandria, VA: United States Army Corps of Engineers Institute for Water Resources.
- Jacobs, Ryan. 2013. "The Forest Mafia: How Scammers Steal Millions Through Carbon Markets." The Atlantic, October 11. www.theatlantic.com/international/archive/2013/10/the-forest-mafia-how-scammers-steal-millions-through-carbon-markets/280419/
- Kaplowitz, M. D., Lupi, F., & Bailey, D. (2008). "Wetland mitigation banking: The bankers' perspective." *Journal of Soil and Water Conservation*, 63(3), 162-172.
- Kenny, Alice. 2009. "Will US Stimulus Lift Mitigation Banks?" Ecosystem Marketplace, February 1. <http://www.ecosystemmarketplace.com/articles/will-us-stimulus-lift-mitigation-banks/>
- Kenny, Alice. 2008. "Attempt at Clarity Muddles Wetland Waters." Ecosystem Marketplace, December 11. <http://www.ecosystemmarketplace.com/articles/attempt-at-clarity-muddles-wetland-waters>

- Kenny, Alice. 2008. "Environmentalists Sound Off on EPA Wetland Regs." Ecosystem Marketplace, April 28. <http://www.ecosystemmarketplace.com/articles/environmentalists-sound-off-on-epa-wetland-regs/>
- Kenny, Alice. 2005. "Proactive Mitigation: the Ecosystem Enhancement Program's approach to wetlands in North Carolina." Ecosystem Marketplace, December 29. <http://www.ecosystemmarketplace.com/articles/proactive-mitigation-the-ecosystem-enhancement-program-039-s-approach-to-wetlands-in-north-carolina/>
- Kenny, Alice. 2008. "New EPA Wetland Guidelines to Boost Mitigation Banks." Ecosystem Marketplace, March 31. <http://www.ecosystemmarketplace.com/articles/new-epa-wetland-guidelines-to-boost-mitigation-banks/>
- Kenny, Alice. 2006. "Supreme Court Decision Leaves U.S. Wetlands (and Bankers) Stuck in the Middle." Ecosystem Marketplace, August 8. <http://www.ecosystemmarketplace.com/articles/supreme-court-decision-leaves-u-s-wetlands-and-bankers-stuck-in-the-middle/>
- Kormos, R., Mead, D., & Vinnedge, B. 2015. *Biodiversity offsetting in the United States: Lessons learned on maximizing their ecological contribution*. Fauna and Flora International. <https://live-fauna-flora-international.pantheonsite.io/wp-content/uploads/old-images/Biodiversity-offsetting-in-the-United-States-2015.pdf>
- Lanser, Christine. 2010. "Government Cutbacks Hit Mit Banks." Ecosystem Marketplace, May 10. <http://www.ecosystemmarketplace.com/articles/government-cutbacks-hit-mit-banks/>
- Levin, Joel. 2014. "Forest Projects in the California Cap-and-Trade." Presentation, ACES Conference, Washington DC, December.
- Mascia, T.J. and Charlotte Brett. 2013. "Banking on Change: Rethinking Wetland Mitigation in the State of New York." Ecosystem Marketplace, March 20. <http://www.ecosystemmarketplace.com/articles/banking-on-change-rethinking-wetland-br-mitigation-in-the-state-of-new-york/>
- National Research Council. 2001. *Compensating for Wetland Losses under the Clean Water Act*. Washington DC: National Academy Press.
- Oregon Department of Fish and Wildlife. 2015. Fish Passage Banking Pilot Overview Document. http://www.dfw.state.or.us/fish/passage/docs/mitigation/Fish_Passage_Banking_Pilot_Overview.pdf
- Page, Joy, and Arthur Harrington. 2013. "Wisconsin's New Wetlands Law Creates Significant Demand for New Wetland Mitigation Banks." Godfrey and Kahn Law, April.
- Pearman, Olivia, and Rachel Plawecki. 2015. *Assessing Compensatory Mitigation Options for Greater sage-grouse Conservation*. Retrieved from <https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/Documents/Assessing%20Compensatory%20Mitigation%20Options%20for%20Greater%20Sage-Grouse%20Conservation.pdf>.
- Penelope, Jemma. 2013. "New Data Shows Mitigation Banks Can Speed Approval Process." Ecosystem Marketplace, May 13. <http://www.ecosystemmarketplace.com/articles/new-data-shows-mitigation-br-banks-can-speed-approval-process/>
- Penelope, Jemma. 2013. "Getting More of a Good Thing? California Introduces New Law on Conservation Banking." Ecosystem Marketplace, June 25. <http://www.ecosystemmarketplace.com/articles/getting-more-of-a-good-thing-br-california-introduces-new-law-on-conservation-banking/>
- Penrith, Sean. 2017. "Implications of California Offset Limit Reduction." The Climate Trust, July 24. <https://climatetrust.org/implications-of-california-offset-limit-reduction-scorcher/>
- RES. 2015. "RES Supports U.S. Government Efforts to Provide Mitigation Predictability and to Enable Natural Resource Conservation Investments." RES, November 5. <https://www.res.us/workspace/media/uploads/memorandum-press-release.pdf>
- RES. n.d. "Developing assets in environmentally sensitive areas." Presentation. RES. https://www.res.us/workspace/media/uploads/developing_assets_1.pdf.
- Richards, Ryan. 2017. *Green Is Good: How Smart Policy Can Sustain Growth of Private Investment in Conservation*. Washington DC: Center for American Progress.

- Schapiro, Mark. 2010 "Conning the Climate: Inside the Carbon-Trading Shell Game." *Harpers Magazine*, February. www.harpers.org/archive/2010/02/conning-the-climate
- Schwartz, Ralph. 2009. "Washington State Struggles in Quest for Mitigation Banking Regulatory Sweet Spot." *Ecosystem Marketplace*, October 20. <http://www.ecosystemmarketplace.com/articles/washington-state-struggles-in-quest-for-mitigation-banking-regulatory-sweet-spot/>
- Shabman, Leonard, and Paul Scodari. *Past, Present, and Future of Wetland Credit Sales*. Washington DC: Resources for the Future, 2004.
- Singh, Damien, Fred Cabbage, Michelle Lovejoy, and Nils Peterson. 2016. *Determine Certainty Program Framework of a Market Based Conservation Initiative for Longleaf Pine Habitat Improvements in Eastern North Carolina*. NC Foundation for Soil and Water Conservation.
- Smerd, Jeremy. "Mitigation Banking: The Problem with Potholes." *Ecosystem Marketplace*. <http://www.ecosystemmarketplace.com/articles/mitigation-banking-the-problem-with-potholes/>
- Society of Wetland Scientists. 2007. "Wetland mitigation banking position statement." Society of Wetland Scientists. http://www.sws.org/wetland_concerns/banking.mgi
- Struck, Doug. 2010. "Buying Carbon Offsets May Ease Eco-Guilt but Not Global Warming." *The Christian Science Monitor*, April 10. www.csmonitor.com/Environment/2010/0420/Buying-carbon-offsets-may-ease-eco-guilt-but-not-global-warming
- The Climate Trust. 2017. 2016 Annual Report. <https://climatetrust.org/portfolio/2016AnnualReport/>
- United States Army Corps of Engineers. 2017. "Credit tracking for all USACE districts." Regulatory In-lieu Fee and Bank Tracking Information System [dataset]. Retrieved May 19, 2017 from <https://ribits.usace.army.mil/>
- United States Army Corps of Engineers. 2018. "Banks and ILF sites." Regulatory In-lieu Fee and Bank Tracking Information System [dataset]. Retrieved January 8, 2018 from <https://ribits.usace.army.mil/>.
- Walton, Robert. 2017. "Carbon cap-and-trade auction between California, Quebec sells out." *Utility Dive*, November 22.
- Weisberg, Peter. 2017. "Climate Trust Sees \$5 Billion New Demand For North American Offsets Through 2030." *Ecosystem Marketplace*, October 31. <http://www.ecosystemmarketplace.com/articles/climate-trust-sees-5-billion-new-demand-north-american-offsets-2030/>
- Wilcox, Meg. 2017. "L'Oreal, Chanel and Nespresso pioneer 'carbon insetting'." *GreenBiz*, February 28. <https://www.greenbiz.com/article/loreal-chanel-and-nespresso-pioneer-carbon-insetting>
- Wolfe, R. L., S. C. Kyle, J. C. Pitman, D.M. VonDeBur, M.E. Houts. 2016. *The 2016 Lesser Prairie-Chicken Range-wide Conservation Plan Annual Progress Report*. Boise, Idaho: Western Association of Fish and Wildlife Agencies.
- Zaman, P. 2016. Learning from the lessons of others: A guide for emerging emissions trading markets. *Carbon & Climate Law Review: CCLR*, 10(3), 227-234.
- Zwick, Steve and Logan Rhyne. 2009. "Must We Manipulate the Market to Save the Market?" *Ecosystem Marketplace*, March 27. <http://www.ecosystemmarketplace.com/articles/must-we-manipulate-the-market-to-save-the-market/>
- Zwick, Steve. 2013. "Why Do Mainstream Media Always Seem To Get REDD Wrong?" *Ecosystem Marketplace*, October 28. www.ecosystemmarketplace.com/articles/why-do-mainstream-media-always-seem-to-get-redd-wrong/



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