Lessons Learned on Demand: A Rapid Review

Preliminary Findings

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Forest Trends' Ecosystem Marketplace

Authors:

Genevieve Bennett, Forest Trends' Ecosystem Marketplace

Melissa Gallant, Forest Trends' Ecosystem Marketplace

Contributing Author:

Kelley Hamrick, Forest Trends' Ecosystem Marketplace

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In compliance markets, regulators are the gatekeepers to demand, both in initial design and implementation/interpretation of trading rules. 18

An industry association can be a very effective force in lobbying for regulatory or market rules that create new demand. 18

Virtually all markets administrators make mistakes early on. If buyers see changes as course-correction rather than a crisis, confidence in the market can be maintained. 19

Markets often struggle with initial buyer perceptions (accurate or not) that offsets and credit trading is risky or overly complex. But it *is* possible to flip the script – especially if support can be gained from an objective third party. 20

Once you remove regulatory risk from the equation, expect buyers to do whatever is easiest and/or lowest-cost for them to do. 20

In compliance markets, the public sector may have the advantage in predicting demand. 21

Depending on the asset type, there may be a demand bias against for-profit suppliers, but this is difficult to conclusively demonstrate. 21

Particularly for carbon, voluntary markets have historically been an incubator of innovative protocols, registries, alliances, and project types that demonstrate the science and test risk management approaches. 22

Pre-compliance has a mixed track record of success in catalyzing demand. In general, demand will emerge if buyers are pretty certain that regulation is forthcoming. 22

Outside of pre-compliance, voluntary markets ultimately have relied on CSR buyers. There, demand ranges from bargain to boutique. 23

Integrating offsets into sustainability frameworks has had a lot of visibility, but so far we haven't seen much impact on voluntary demand. 23

On the other hand, broad initiatives that encourage businesses to take concrete steps are a recent bright spot in voluntary carbon offsets markets, where lack of federal climate action is a high-visibility issue and the global nature of climate change creates a big enough bandwagon. 24

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Rapid Review Scope & Methods

Markets and Geography

Voluntary Carbon Offsets

Compliance Forest And Land-Use Carbon Offsets

Compliance Wetland/Stream Compensatory Mitigation

Compliance & Voluntary Conservation Banking And Crediting Systems

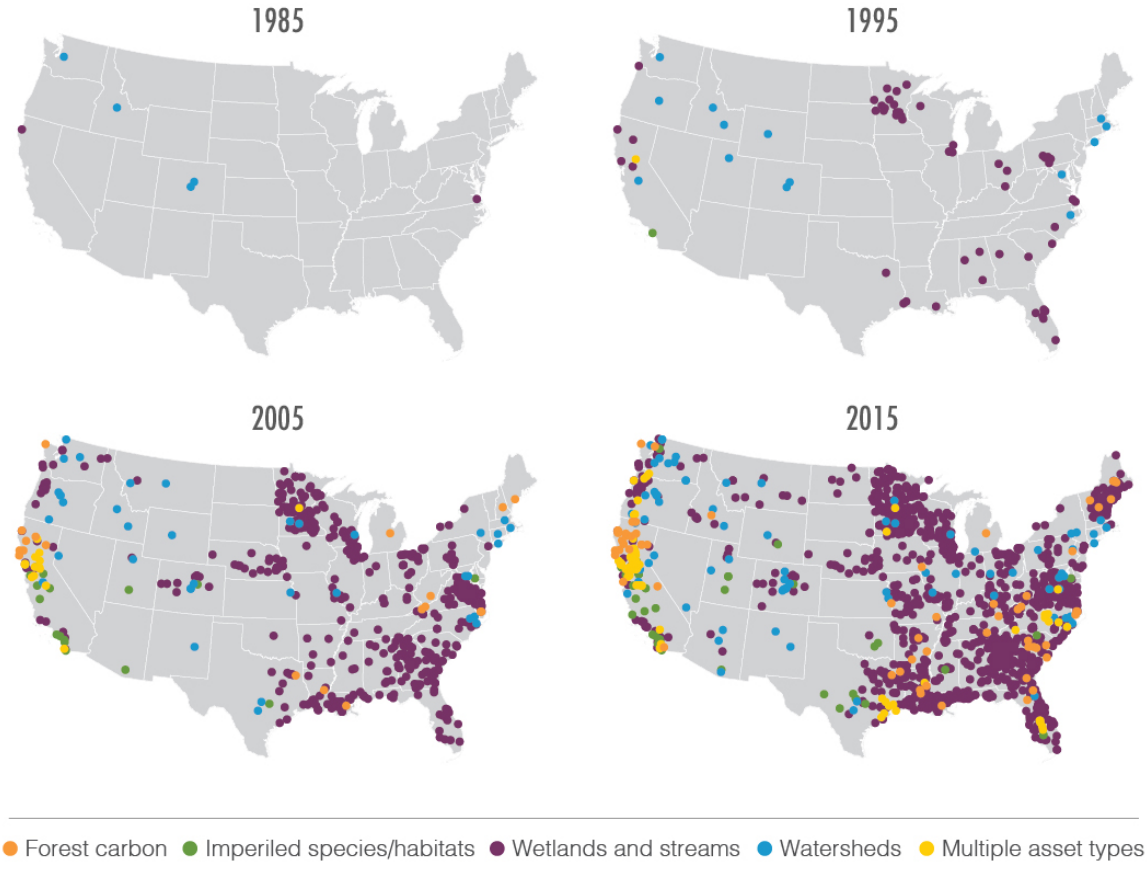
Geography: Primarily focused on the United States

Methods

- We conducted a targeted rapid review of academic and grey literature (journalistic coverage, conference presentations and proceedings, policy/ regulations/ memoranda/ guidance, reports, program reports) and Ecosystem Marketplace's historical published markets analysis and internal data.
- Sources were selected based on their relevance to the topic, frequency of citation, presence in reference lists in literature consulted or database searches for similar articles, or connection with major market actors (i.e., significant market share or influence over market activity or design).
- The goal is to use a purposive sampling approach that yields highly relevant, information-rich analysis, findings, or reflections on market demand dynamics, rather than a comprehensive literature review. Emphasis was placed on case studies and synthesis of real-world evidence over purely theoretical or model-based work.
- Iterative approach: Based on feedback on preliminary findings, additional research and coding/analysis of findings may be conducted.
- The rapid review prioritized real-world evidence over theoretical discussions or simulations. That said, the market mechanisms reviewed vary enormously in how "market-like" they are, their maturity, number of transactions and buyers, and quality and transparency of data. Thus "real-world evidence" also varies quite a lot in terms of robustness, sample size, and our own level of confidence.

Ecosystem Markets in the United States: History and Context

Map: Location of Ecosystem Service Asset Providers in the United States, 1985-2015

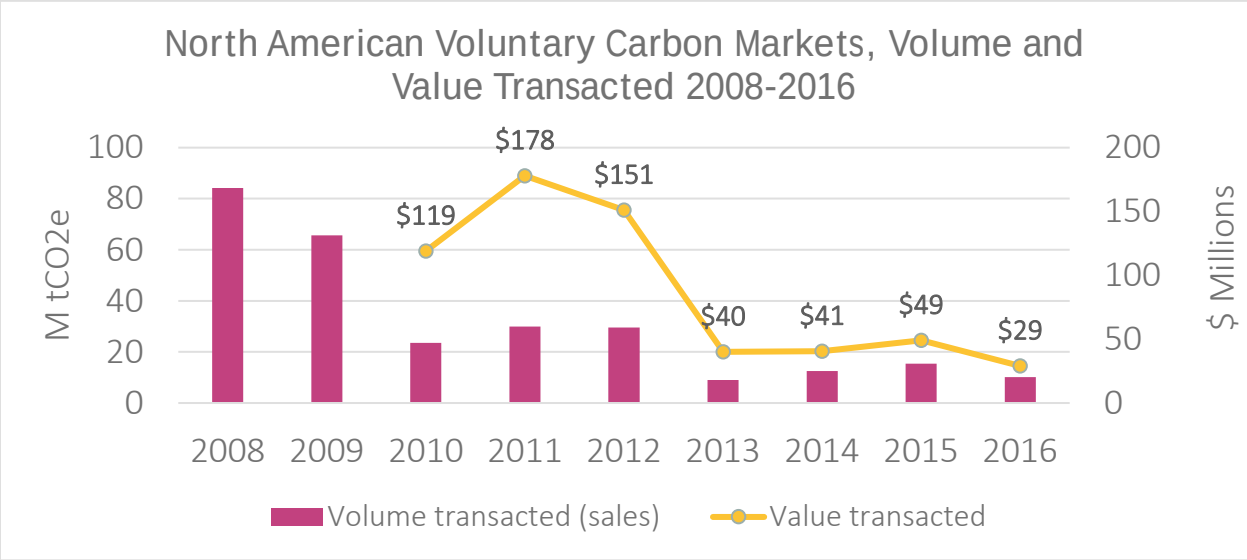


Source: Forest Trends' Ecosystem Marketplace. 2016. An Atlas of Ecosystem Markets in the United States. *Washington DC: Forest Trends.*

Notes: Each point represents one initiative. "Multiple asset types" refers to projects that generate multiple ecosystem credit types in order to sell credits in more than one ecosystem market. For example, a restoration project might be approved by regulators to sell either wetland credits or species credits.

Voluntary Carbon Offsets: History of Activity and Demand Dynamics

The voluntary carbon marketplace encompasses all transactions of carbon offsets that are not purchased with the intention to surrender into an active regulated carbon market.



Source: Ecosystem Marketplace proprietary dataset.

Notes: Transaction value is unavailable for 2008 and 2009. Offset inventory data is forthcoming.

A Timeline of Demand Drivers

2006 First survey of voluntary carbon markets find $91M in transactions ($54.9 over the counter; $36.1M via the Chicago Climate Exchange or CCX). Amidst backlash against a perceived lack of standards, buyers say quality is more important than price.

2008 Private companies continue to dominate the buy-side of the voluntary market (66% of volume), with purchasing for investment/resale now the largest overall motivation (35%) instead of retirement (29%). This suggests a higher contribution from intermediaries in the market.

CCX trades overtake the OTC market on the back of climate legislation proposed in the US in 2008.

Voluntary markets slow as companies cut discretionary spending during the global recession

2009 Volume declines 26% and value 47% from 2008, as companies cut back on discretionary funding for CSR initiatives and prospects for new compliance demand remain uncertain.

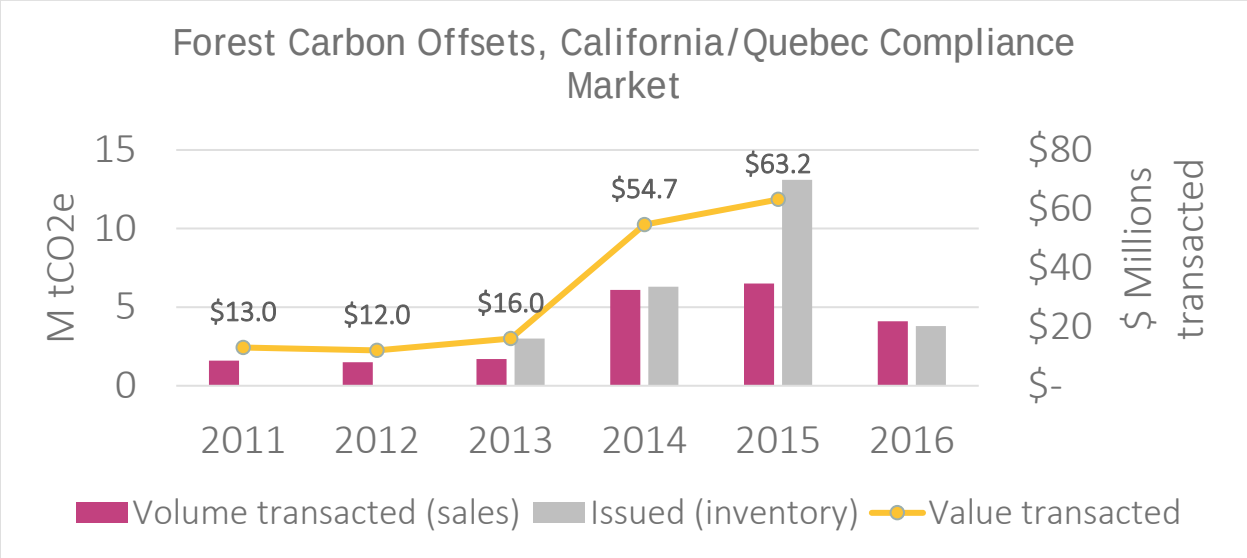
Within the CCX, prices crash along with demand, thanks to a drop in speculative activity as well as a shift to the OTC market via privately negotiated transactions as buyers get pickier about which offset credits they want.

Failure of the of American Clean Energy and Security Act bill in summer 2009. Project developers turn to voluntary markets in search of demand.

2010	Transactions collapse on the CCX as the US Senate fails to secure a climate bill. Legacy CCX offset tonnes will continued to be traded through February 2013 but at rock-bottom prices.
2011	Demand for offsets from emerging projects with significant additional environmental and social benefits (“co-benefits”) pushes the market-wide average price above $6.2/tCO2e.
2012	European demand for voluntary offsets surges and North American pre-compliance buyers begin dabbling in the voluntary carbon market ahead of California’s cap-and-trade regulation. Buyers tells Ecosystem Marketplace that the more nuanced goal of "demonstrating corporate leadership" has taken the place of "marketing and public relations" as the primary reason for voluntary offsetting.
2013	Offsets sourced from forestry and land use projects for the first time surpassed renewable energy as the most popular project type globally.
	Pre-compliance offsets fall from 15M tonnes in 2012 to just 300,000 tonnes. Nearly all of the missing volume has migrated into the California compliance cap-and-trade market.
	Prices in the voluntary markets fall in 2013 across all offset types - except for projects designed as early-action for the future California market. Project developers blame falling demand on the "purely voluntary" market on too much supply, a glut of uncharismatic project types, and declining demand from CSR-driven companies.
2014	Forest carbon project developers report downward pressure on prices as cheaper offsets flood the market, drawing away buyers seeking to simply hit CSR targets.
	This year, only 5% of buyers are new to the market. Suppliers tell EM that experienced buyers' greater market familiarity increases their ability to negotiate lower prices.
2016	The International Civil Aviation Organization (ICAO) finalizes its proposed standard to reduce emissions in all new aircraft, raising hopes for a new source of demand.
	Forestry and land-use offset demand makes up only 14% of total market volume in North America, but fetch far higher prices: they account for 41% of total market value.
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 commit to the agreement. These efforts are expected to largely rely on a combination of state and local-level policy and voluntary actions.

Compliance Forest and Land-Use Carbon Offsets: History of Activity and Demand Dynamics

Compliance carbon markets are marketplaces through which regulated entities obtain and surrender emissions permits (allowances) or offsets in order to meet predetermined regulatory targets.



Source: Ecosystem Marketplace proprietary dataset.

Notes: Transaction value data cannot yet be released for 2016. 2016 issuances/transactions data is preliminary. Issuance data for 2011-2012 will be integrated shortly.

A Timeline of Demand Drivers

2005 The RGGI MOU is signed by seven states.

2006 The California Global Warming Solutions Act of 2006 (AB32) establishes 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 and some parts of AK.

2007 Official start date for forest offset activities eligible for inclusion in California market.

The Western Climate Initiative (WCI) announces a partnership between 11 North American jurisdictions (Arizona, California, Montana, New Mexico, Oregon, Utah and Washington in the US, and British Columbia, Manitoba, Ontario and Quebec in Canada) with plans to implement a regional cap-and-trade program in 2012. Arizona, Utah, and Montana will defect from the proposed trading plan in the next three years.

2008 First auction of RGGI pre-compliance emissions allowances takes place.

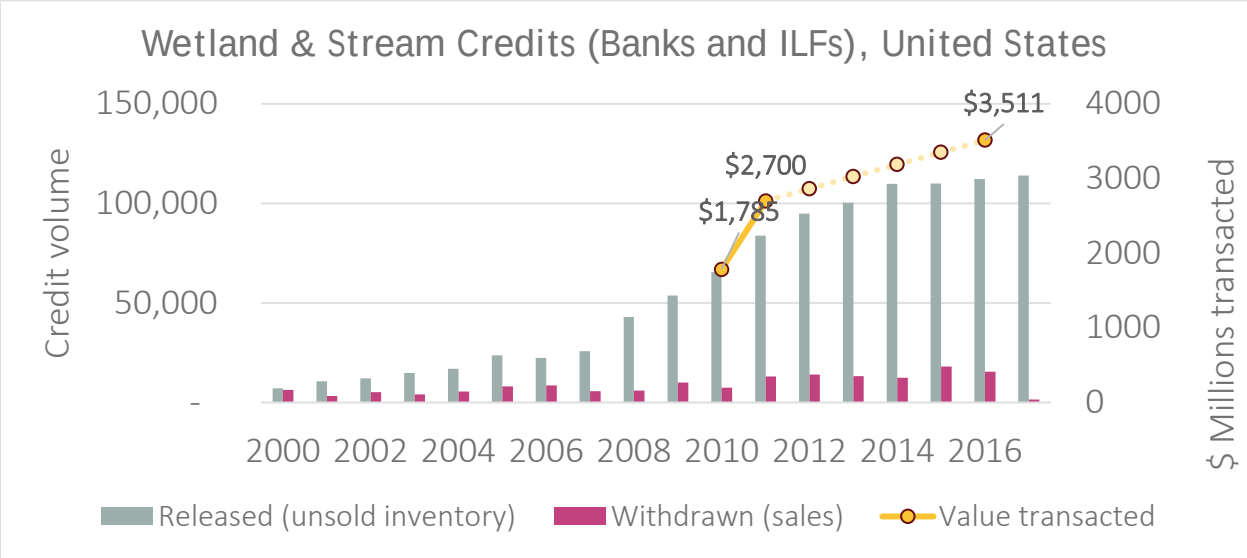
2009 RGGI compliance period begins. Afforestation offsets are permitted as a "cost containment" mechanism that can be used if allowances rise above certain thresholds, but non-RGGI states need an MOU in order for their projects to sell offsets into the RGGI market. Project developers tell EM they are 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 (CARB) suddenly recalls its approval of all four voluntary offset standards, which project developers had assumed were guaranteed a place in the future compliance market.
2011	CARB adopts final cap-and-trade program regulations. Offsets are allowed for 8% of total compliance obligations.
2013	RGGI updates its "Model Rule," lowering the market cap to correct earlier over-allocation of allowances. The new Cost Containment Reserve (CCR) eliminates the previous offset mechanism and instead sets price thresholds at which additional allowances are be released into the system. Allowances prices rise in response to the lower cap.
	Parhelion Underwriting Ltd begins offering insurance coverage against the risk of offset invalidation by CARB.
	The Compliance Offset Developers Association (CODA) forms to work with CARB on procedural and technical issues related to offsets in the California market.
	California issues the first forest carbon offsets for IFM projects in California and Maine. Development of forest carbon projects for California is initially slow because CARB rules governing these projects were incredibly confusing, especially with regard to buffer pool and invalidation rules governing liability in the case of offset reversals, project developers tell Ecosystem Marketplace.
2014	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; forestry initially had stood apart from other project types when it came to invalidation risk.
	EPA 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 EPA in the power sector.
	Project developers say CARB's snail's pace in issuing compliance offsets to early action carbon projects may result in their missing deadlines for transitioning to the compliance regime.
	Trading of offsets for the California market drops substantially during CARB's five-month investigation of an Arkansas facility producing ozone-depleting substances (ODS) offsets. Invoking buyers' liability provisions, CARB ultimately invalidates 85,955 offsets from the facility, which had been operating out of compliance with a permit.
	The first compliance period of CA cap-and-trade wraps up, with demand for offsets coming in well under what was permitted by the market. Among the reasons are the limited number of offsets protocols and the slow pace of CARB verification and issuance. Project developers say lingering concerns over invalidation risk, particularly over a lack of clarity over where the ARB staff will draw the line on what truly constitutes a violation rising to the level of invalidation, also continue to haunt the California market.

2016	Ontario issues proposed regulations for a cap-and-trade program that will link to California's and Quebec's programs.
	RGGI allowance prices begin to fall as it becomes clear that Clean Power Plan will not be implemented.
	First project developing offsets for sale to RGGI market begins.
	The state of Washington's Clean Air Rule is announced introducing a trading mechanism for significant in-state stationary sources, petroleum product distributors and importers, and natural gas distributors to meet greenhouse gas emissions caps. Starting January 2017, 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.
	RGGI program review. Model Rule amendments are still being finalized, but RGGI states announce that the market cap will be lowered another 30% by 2020. Allowance prices begin to rise.
2017	CARB 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, and at least half of offsets must come from projects "directly benefitting" California. Offset developers pin their hopes on continued demand from Ontario and Quebec.

Wetland/Stream Compensatory Mitigation: History of Activity and Demand Dynamics

Compensatory mitigation is an umbrella term for the three main mitigation types (permittee-responsible mitigation, In-lieu fee compensation, and mitigation banking) that may be used as the final step of the mitigation hierarchy to address residual negative impacts. In the United States, compensatory mitigation is required for impacts to wetlands and streams under Section 404 of the Clean Water Act.



Source: Ecosystem Marketplace proprietary dataset.

Notes: Value estimates are only available for the years 2010, 2011, and 2016.

A Timeline of Demand Drivers

1995 The first federal guidance on wetland compensatory mitigation is released.

2001 The National Research Council publishes an assessment of wetland compensatory mitigation finding that banking outperforms other mitigation types in terms of ecological risk. It also shows that while the loss of total wetland area has slowed in the past two decades, the goal of "no net loss" of wetlands (particularly when one takes into account wetland functions) is not being met by mitigation.

Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers. The decision that the Corps did not have jurisdiction over hydrologically isolated wetlands on the basis of the so-called "migratory bird rule" is blamed by project developers for demand falling by as much as 50% in the Chicago area.

North Carolina begins its Ecosystem Enhancement Program 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. An internal memo from EPA Assistant Administrator for Enforcement Granta Y. Nkayam says *Rapanos* "negatively affected approximately 500 enforcement cases." Agencies, the

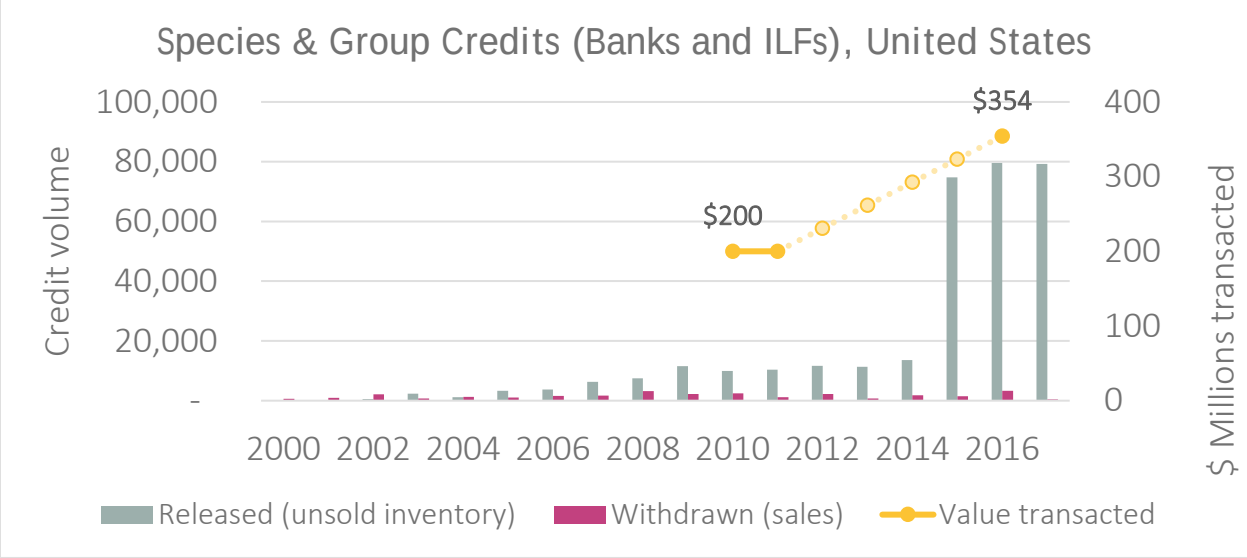
	memo said, either declined to pursue enforcement or lowered its priority. Bankers reported in some states including Florida permitting was taking "twice as long."
2008	The Corps and EPA release the Final Rule, ushering a raft of changes including a preference for banks, then ILFs, then PRM. It also improves transparency; harmonizes standards for advance planning, implementation and management; emphasizes a watershed approach to mitigation planning; and puts in place strict timetables for Corps decisions on bank approvals. The Rule begins to create business for third-party mitigation: the share of wetland acreage mitigated through bank credits or ILFs will grow from 25% in 2010 to over 40% of impacts by 2014.
	New guidance from EPA and the Corps attempt to provide clarity after Rapanos. Developers, environmentalists, and wetland bankers are nearly united in their disparagement of the new document.
	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.
2009	Mitigation bankers pin their hopes on a federal stimulus package to shore up demand as private buyers evaporate in the recession. But 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	EPA issues draft guidance on Clean Water Act jurisdiction, attempting to put to bed uncertainty over the issue and particularly the definition of "significant nexus."
	Freedom of Information Act data that Ecosystem Marketplace received from the US ACE in May of 2011 shows that nationally, mitigation is still sourced predominantly from permittee-responsible mitigation (67%), followed by mitigation banks (26%) and then In Lieu Fee Funds (7%).
2013	Bankers take advantage of improvements in transparency, using Army Corps of Engineers data to demonstrate that permitting is significantly faster when bank credits are used compared to other mitigation types.
2014	The US Environmental Protection Agency (EPA) and the US Army Corp of Engineers 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	EPA and the Corps 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.
2016	The USDA Natural Resources Conservation Service provides more than $7M in funding to support the development of new agricultural wetland mitigation banks in ten states in the Midwest and

	Northern Great Plains, aiming to provide a supply of mitigation credits for farmers seeking to meet conservation compliance requirements.
2017	The National Mitigation Banking Association splits into two factions: the Ecological Restoration Business Association which broaden its umbrella to include other members of the restoration industry (and whose leadership, dominated by larger firms, intends to devote more effort to courting private investment, bankers tell Ecosystem Marketplace); and the National Environmental Banking Association which remains focused on mitigation banking.
	EPA announces that it will begin the process of repealing the 2015 Clean Water Rule.

Conservation Banking & Crediting: History of Activity and Demand Dynamics

Conservation banks are permanently protected sites where habitat for listed species and related ecosystem services are conserved and managed in perpetuity for the purpose of offsetting impacts that have occurred elsewhere to endangered, threatened, candidate or other species of concern. Conservation banking is enabled in the United States by the legal requirements of the Endangered Species Act. Specifically, Section 7 requires federal agencies to consult with the U.S. Fish and Wildlife Service regarding potential impact to threatened and endangered species, and Section 10 requires "incidental take permits" and Habitat Conservation Plans for those impacts.

Habitat crediting systems also develop species or habitat credits for voluntary, pre-compliance, or compliance markets but may not establish an exchange platform to mediate trades between many buyers and sellers. One increasingly popular model for habitat crediting is the "Habitat Exchange." 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 the U.S. Fish and Wildlife Service has determined that Endangered Species Act listing is warranted but precluded.



Source: Ecosystem Marketplace proprietary dataset.

Notes: Value estimates are only available for the years 2010, 2011, and 2016.

A Timeline of Demand Drivers

2003	The US Fish and Wildlife Service 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.
	Mitigation bankers pin their hopes on a federal stimulus package to shore up demand as private buyers evaporate in the recession. But 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.
2013	A report on the status of the lesser prairie chicken finds fewer 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	Department of Interior releases a strategy aimed at improving mitigation policies aiming to enhance the conservation outcomes and also improve the efficiency of the permitting process for infrastructure and development projects.
2015	Sweetwater River Conservancy opens the first greater sage-grouse conservation bank in Wyoming. It is the largest bank in the United States.
	Barrick Gold Corp., the U.S. Fish and Wildlife Service, The Nature Conservancy, and the Bureau of Land Management sign a deal to establish a conservation bank for greater sage grouse habitat credits.
	A consortium of energy companies and NGOs in collaboration with the Western Association of Fish and Wildlife Agencies (WAFWA) unveil the Lesser Prairie Chicken Range-wide Conservation Plan, which aims to proactively conserve chicken habitat-mitigating species loss and thereby preclude listing under the Endangered Species Act. The plan relies on a large in-lieu fee mechanism. Bankers are critical of the WAFWA plan, which they say relies irresponsibly on temporary mitigation.
	The US Fish and Wildlife Service decides that a listing status under the Endangered Species Act (ESA) for the greater sage grouse is not warranted, citing voluntary efforts to conserve the species' dwindling habitat as the prime reason.
	President Obama releases a memorandum to strengthen and streamline landscape-level mitigation policy within five federal agencies, directing them to follow the mitigation hierarchy. Streamlining mitigation rules and processes is expected to lead to an upswing in private investments for natural resources.
2016	The first habitat exchange is approved by state and federal agencies. Located in Nevada, it supports conservation credits for greater sage grouse habitat. Habitat Exchanges differ from traditional conservation banking in that they have developed a universally applied Habitat Quantification Tool to determine credits for all new projects, rather than regulators' determining credits on a case-by-case basis. Supporters of the model say this will streamline the crediting process.
	The US Fish and Wildlife Service 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.
	The US Fish and Wildlife Service removes the Lesser Prairie Chicken from the Endangered Species List.
2017	The US Fish and Wildlife Service publishes a Director's Order to provide incentives for landowners to conserve candidate species.

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 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."

First 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.

Lessons Learned On Demand: Preliminary Findings

In compliance markets, regulators are the gatekeepers to demand, both in initial design and implementation/interpretation of trading rules.

- For example, private wetland/stream mitigation banks say that agency referrals account for nearly 60% of their clients (Kapolowitz et al. 2008). The 2008 Final Rule establishes a regulatory preference for banking over In-Lieu Fee and permittee-responsible mitigation. Yet a shift in demand toward banking has not been as pronounced as might have been expected. Why not?
    - A key reason is that the Army Corps of Engineers allows *significant* regulatory discretion within individual districts. Regulatory discretion leads to variations in regulator behavior, which affects demand both positively and negatively. Regulators have direct impacts on demand in the degree to while they follow the 2008 Final Rule preference (which is only considered a "soft" preference) and through their policy on setting bank service areas (each Corps district has its own). Indirectly, regulators can 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.
- The regulatory driver for conservation banking and crediting, the Endangered Species Act sections 7 & 10, lacks the clarity of the Clean Water Act in terms of the obligation to offset. Regional and state offices may or may not prioritize compensation (enforcement is a primary reason that California has so many conservation banks, and Texas relatively few), or may only require it for large private sector projects (Kormos et al 2015).
- The difference in the treatment of offsets by the two compliance carbon markets in the US offers another illustrative example:
    - The Regional Greenhouse Gas Initiative (RGGI) incorporated offset trading as a cost containment mechanism, to be used only if allowance prices reach a certain threshold as a cost containment mechanism. Since prices have been low, there were no offset transactions until 2017 (supplied by a landfill gas project).
    - California, on the other hand, allows offsets to count for up to 8% of a company's overall emissions reductions. Over 60 million tonnes have been traded since the market began in 2013.

Notes: This is probably an obvious point for NNWQT, but it bears mentioning that compliance buyers are very risk-intolerant when it comes to regulatory uncertainty.

An industry association can be a very effective force in lobbying for regulatory or market rules that create new demand.

- The Ecological Restoration Business Association (ERBA; formerly the National Mitigation Banking Association) through its 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 In-Lieu Fee 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.

- In California, the Compliance Offsets Developers' Association (CODA) has brought together the largest carbon offset developers serving the market to provide coordinated input to regulators and market administrators on trading program amendments and technical issues.

Virtually all markets administrators make mistakes early on. If buyers see changes as course-correction rather than a crisis, confidence in the market can be maintained.

Some recurring problems and how they've been handled:

- Demand outstripping supply:
    - In the California carbon market, offset supply in the early days was relatively low thanks to the small number of protocols accepted and the slow pace of CARB verification of early-action offsets seeking to transition to the compliance regime. This issue may yet rear its head again in 2021, thanks to the 2017 decision to limit out of state offsets (or at least the failure to not signal that decision earlier).
    - Little early supply development is also predicted to be a challenge in the forthcoming International Civil Aviation Organization (ICAO) carbon offset program for the same reason: rules about what offsets will be allowed are still unclear, hindering early movement.
- Supply outstripping demand:
    - Meanwhile, RGGI in its early years faced a glut of supply. Regular reviews of the carbon cap-and-trade instrument provided an opportunity to adjust the market cap and signal to buyers that the reductions were coming. Administrators also adjusted the cost-containment provisions at the same time, anticipating that allowance prices would rise. Prices rose, the containment mechanism was triggered, and participants came away with a sense that the market was being pretty well-managed.
- Insufficient attention paid to legal frameworks:
    - Invalidation risk concerns depressed forest and land-use carbon offset demand in the California compliance market in 2013 and 2014. Forestry offsets initially operated under different buyer liability provisions, which confused everyone, and CARB did not clearly communicate under what circumstances they would invalidate offsets.
    - A famous example comes from the European Union's Emissions Trading Scheme, where criminals hacked national registries, stole emissions allowances, sold them, and disappeared with the VAT taxes collected – estimated at about €5 billion. Buyers and market intermediaries such as retailers lost confidence in market administrators, and some intermediaries (who are after all there voluntarily) pulled out. This could have been avoided if market administrators had simply recognized that emissions allowances are

assets, not merely compliance units, and thus need adequate legal and IT protections (Zaman 2016).

Markets often struggle with initial buyer perceptions (accurate or not) that offsets and credit trading is risky or overly complex. But it *is* possible to flip the script – especially if support can be gained from an objective third party.

- In wetland/stream compensatory mitigation for example, banking was initially regarded by buyers as more cumbersome than in-house compensation (e.g. permittee-responsible mitigation). The mitigation banking industry has addressed this perception aggressively.
- Their lobbying has focused intensively on the issue of risk. A 2001 National Research Council study and a 2007 position statement from the Society of Wetland Scientists suggesting that banking has some advantages over other mitigation types were frequently cited in the early years by bankers as objective, science-driven "evidence" in favor of banking.
- Banks' marketing strategies also often emphasize 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* banks, and position banks as experts that can lead clients through complex permitting.

Once you remove regulatory risk from the equation, expect buyers to do whatever is easiest and/or lowest-cost for them to do.

- Buyers may like the simplicity of paying a fee over buying a credit, especially when the compliance driver is new and unfamiliar.
    - Oregon's Carbon Dioxide Standard requires new power plants to reduce carbon dioxide emissions onsite, develop emissions reduction projects, or fund emissions reduction projects carried out by a state-recognized nonprofit. To date, *all* new plants have chosen to pay a fee to the Climate Trust.
    - In a survey of potential buyers of greater sage-grouse credits, buyers preferred an in-lieu fee instrument to banking, apparently because many had familiarity with ILFs in other contexts and they liked cost certainty. (This was a very small sample, however.)
    - North Carolina's Division of Mitigation Services follows this logic, 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.
- Time is money!
    - Wetland/stream mitigation bankers use the faster permit approval times associated with purchasing bank credits as a major marketing point in courting buyers.
- Demand for wetland/stream mitigation bank credits is largely driven by *small* impacts. For only a small impact, buyers find it easier and relatively lower-cost to buy credits than mitigate for impacts themselves.*

- Notes: *It should be noted that regulators may encourage buyers to do this; some bankers have reported to Ecosystem Marketplace that Corps staff will "save" credits for small impacts and direct permittees with bigger impacts toward permittee-responsible mitigation, contravening the Final Rule.

In compliance markets, the public sector may have the advantage in predicting demand.

- The public sector controls not just regulatory drivers but often a large share of demand too (for example infrastructure projects requiring mitigation credits).
- 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, the Corps, and ten other state and federal agencies to find ways to proactively meet mitigation needs. The resulting Division of Mitigation Services (formerly 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 RFPs held 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 risk of predicting demand and ensuring a pipeline of approved credits.

Depending on the asset type, there may be a demand bias against for-profit suppliers, but this is difficult to conclusively demonstrate.

- Purely voluntary (e.g. not pre-compliance) carbon offsets buyers have shown an affinity for NGO-led projects – which makes sense given the often philanthropic nature of voluntary demand.
- There is less data on conservation banking and credits to investigate when it comes to buyer preferences (particularly since thin markets may mean buyers do not have a choice of suppliers). But interviews with industry on potential demand for greater-sage grouse habitat compensatory mitigation indicated overarching distrust of conservation suppliers who had a profit motive. Companies said they would prefer to work with NGOs (Pearman and Plawecki 2016).
- In the wetland/stream mitigation markets, some evidence has been found that private buyers prefer private sector providers, while public agencies seek out public mitigation providers (Kaplowitz et al. 2008).

Particularly for carbon, voluntary markets have historically been an incubator of innovative protocols, registries, alliances, and project types that demonstrate the science and test risk management approaches.

- For example, proposed federal climate legislation in the United States and federal offset programs in Australia referenced standards developed in the voluntary carbon markets.
- California's carbon cap-and-trade program also uses protocols originating in the voluntary markets.
    - Approved forest and land-use methodologies include forestry (Improved Forest Management, reforestation, and avoided conversion), urban forestry, and rice cultivation projects.
    - Other new methodologies currently testing voluntary offset market waters but not yet under consideration for compliance include international REDD+, transportation efficiency, grasslands and wetlands.
- Voluntary markets have also been ahead of the curve in accounting for carbon leakage outside of a project area, safeguarding community rights and biodiversity, and "nesting" projects within regional efforts to scale up forest conservation.

Pre-compliance has a mixed track record of success in catalyzing demand. In general, demand will emerge if buyers are pretty certain that regulation is forthcoming.

- Buyers will engage in pre-compliance activities to get a head start if they expect that a compliance market/regulatory driver will emerge.
    - Pre-compliance activity was reasonably strong prior to the start of the California carbon cap-and-trade program and in Australia's carbon market. In both cases there was a sense among buyers that the political will existed to see the program through.
    - 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.
    - Lesser prairie chicken range-wide population numbers plummeted just as USFWS was considering listing. That may have motivated potentially regulated entities, believing there was a good chance that the LCP would be listed, to come up with a voluntary plan. Voluntary in-lieu fees in 2016 collected through the WAFWA program amounted to about $4M.
- There is mixed evidence that buyers will show demand for pre-compliance offsets or credits in order to stave off regulation if there is less certainty that it is forthcoming. Buyers may wait and see.
    - A (small) survey of potential buyers of greater sage-grouse mitigation showed they were taking a "wait and see" approach – they wanted mitigation options (and thus appreciated all the voluntary work to build out market infrastructure) but had no concrete plans to

put money down yet (Pearman and Plawecki 2016). To date we have tracked only two examples of demand for GSG credits (Barrick Gold, which created its own credit bank, and Kinross Gold, which recently completed a transaction in Nevada).

    - Chicago Climate Exchange, Gopher tortoise: May be seen by buyers of cautionary tales where regulators ultimately did not act.

- Notes: From a regulatory and conservation point of view, pre-compliance action to developer voluntary conservation strategies and voluntary market supply/infrastructure can of course be very positive for a species even if little demand materializes.
- Voluntary markets contracted once the California cap and trade program launched in 2013. Voluntary market administrators should anticipate this and take steps so suppliers can migrate to the compliance market and not be stranded.

Outside of pre-compliance, voluntary markets ultimately have relied on CSR buyers. There, demand ranges from bargain to boutique.

- We have seen voluntary carbon offsets buyers grow more and more sophisticated over the past decade.
    - "Bargain" buyers seeking to meet quantitative commitments may just want whatever is cheapest (often methane in the US).
    - "Boutique" buyers will want a great story, co-benefits for communities/biodiversity/water – and once they get familiar with the market, they will try to negotiate lower prices.
        - If companies have an internal price on carbon, that may be a big factor in what they are willing to spend on offsets. Disney for example has an $11-14/tonne internal price while voluntary offsets in North America traded at the average price of $2.9/t in 2016. Disney has been a reliable buyer of more expensive offsets such as those from forestry projects delivering lots of co-benefits. Similarly, in sectors where brand management is very important, charismatic but pricier offsets may be more popular.

Integrating offsets into sustainability frameworks has had a lot of visibility, but so far we haven't seen much impact on voluntary demand.

- Many have actually not provided much of a role for carbon offsetting, or are clearly wary of the mechanism.
    - Carbon Disclosure Project doesn't actually give companies much "credit" for offsetting. We haven't seen evidence CDP reporting has motivated new demand for offsets.
    - In 2015, revisions to the Greenhouse Gas Protocol Corporate Standard allowed companies use renewable energy certificates (RECs) for scope 2 emissions - but not offsets. Many market participants tell us that there could be a shift in demand away from carbon offsets in favor of approved RECs.

- Frameworks that *do* treat carbon offsets more positively haven't had much traction either.
    - US Green Building Council added the use of carbon offsets to its v4 building design + construction certification, which allows buildings to earn LEED points by using RECs or carbon offsets. There hasn't been a big impact on voluntary offset demand.
    - Ditto public sector efforts (Australian government standard for carbon neutral projects, UK Woodland Carbon Code).

On the other hand, broad initiatives that encourage businesses to take concrete steps are a recent bright spot in voluntary carbon offsets markets, where lack of federal climate action is a high-visibility issue and the global nature of climate change creates a big enough bandwagon.

- We have seen voluntary carbon offsets buyers' motives shift from CSR to the desire to demonstrate leadership and keep up w peer companies/ industry norms (the "bandwagon effect.") Initiatives like the Science Based Targets, the Presidents' Climate Leadership Commitments for US colleges and universities, the Carbon Neutral Cities Alliance, and others recognize businesses for their environmental performance, and encourage others to follow their lead.
- Unlike companies making their own commitments, initiatives provide a credible, off-the-shelf framework for action. 262 companies have committed to science-based emissions reductions targets in line with keeping a global temperature increase below 2 degrees Celsius. As these companies seek to make good on their promises, they may turn to offsetting once they have taken other measures to reduce their carbon footprint.
- *If* recommended guidance refers to offsetting, that can drive demand. The Presidents' Commitment allows limited use of offsets. Currently, the Science Based Targets do not. In other words, this is still more potential than actual. Drawing a precise connection to voluntary market transactions is difficult, but many market participants tell us they believe it supports the market.