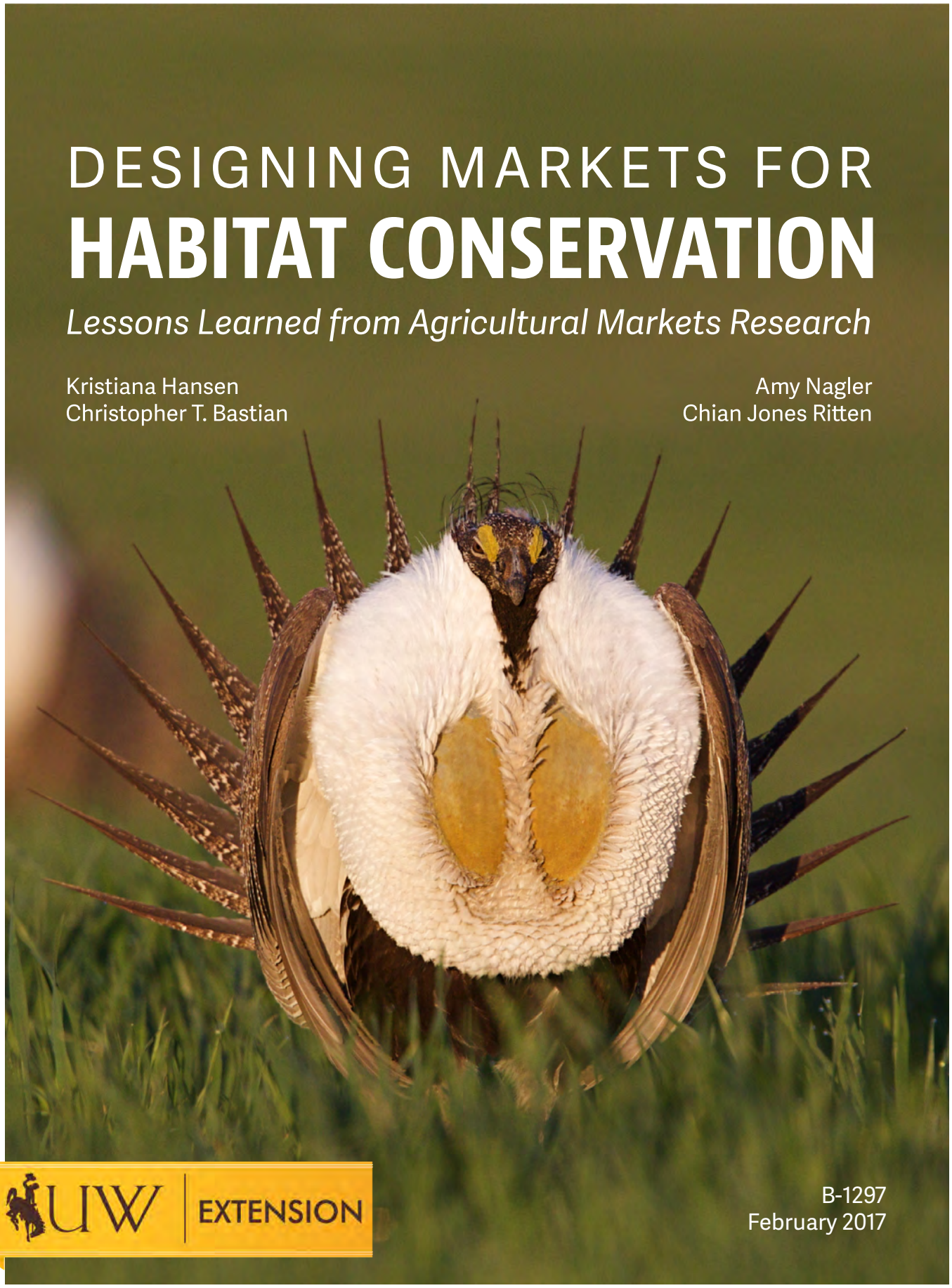
DESIGNING MARKETS FOR HABITAT CONSERVATION

Lessons Learned from Agricultural Markets Research

Kristiana Hansen
Christopher T. Bastian

Amy Nagler
Chian Jones Ritten



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Designing Markets for Habitat Conservation: Lessons Learned from Agricultural Markets Research

Authors

Kristiana Hansen, associate professor; Christopher T. Bastian, associate professor; Amy Nagler, research scientist; and Chian Jones Ritten, assistant professor, Department of Agricultural and Applied Economics, College of Agriculture and Natural Resources, University of Wyoming

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This bulletin applies research on agricultural markets to new market-based approaches for habitat conservation, focusing on issues related to establishing a market – the rules and structures that will best allow sellers and buyers to trade habitat credits.

Results highlight the importance of considering market design when setting up a conservation bank or conservation exchange, as the rules of trading can affect market outcomes for buyers and sellers. Our intended audience includes those interested in a deeper understanding of the role of market incentives in conservation policy, including landowners interested in selling conservation, parties seeking off-site mitigation, and policymakers.

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DESIGNING MARKETS FOR HABITAT CONSERVATION: *Lessons Learned from Agricultural Markets Research*

Market-based conservation programs have many moving parts:

Regulations drive demand. State and federal regulations that require compensatory mitigation are the primary driver for conservation markets. Without such regulations, there would be significantly less demand for conservation from private buyers. (See Hansen, Jakle, and Hogarty 2013 for more information.)

How is habitat's ecological value measured? The biology and ecology of the species, habitat, or natural resource are also important to designing conservation programs. (See Doherty et al. 2010 for more information.)

How can landowners participate in market-based conservation programs? The U.S. Fish and Wildlife Service provides guidance on forming conservation banks (USFWS 2012). Conservation exchanges are mostly still in development throughout the western U.S. The Wyoming Conservation Exchange (2017) provides a description of how a landowner might participate.

This bulletin focuses on issues related to establishing a market and how market rules can affect outcomes for conservation buyers and sellers.

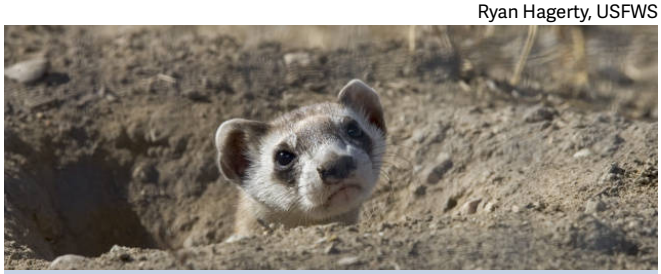
Introduction to the market-based conservation concept

Privately owned agricultural lands provide important habitat for many species. Conservation on these lands is increasingly recognized as a vital component of meaningful habitat preservation (SGI 2014). Several policies initiated by the U.S. Fish and Wildlife Service (USFWS) are designed to facilitate landowner participation in habitat conservation for species listed as threatened or endangered under the Endangered Species Act (ESA) or non-listed species that are candidates for protection. For example, landowners can receive regulatory protections for a listed species by participating in a Safe Harbor Agreement or receive regulatory protections for a non-listed species by participating in a Candidate Conservation Agreement with Assurances.

In addition to regulatory protection, agencies and organizations recognize landowners may need financial compensation to make habitat conservation more attractive. As such, a growing number of programs provide financial incentives to landowners to implement conservation. One example is the Sage Grouse Initiative, which offers compensation to private landowners through the Natural Resources Conservation Service (SGI 2017).

A relatively new financial incentive for landowners is to sell conservation benefits they have generated on their

Ryan Hagerty, USFWS



What are Safe Harbor Agreements (SHAs)?

SHAs establish formal partnerships between private landowners or other non-federal parties and the USFWS designed to protect habitat of species **listed** as endangered or threatened under the Endangered Species Act (USFWS 2011a). SHAs provide assurances that if landowners undertake agreed-upon conservation actions, USFWS will not impose additional restrictions. SHAs relieve landowners of liability under the ESA if their conservation practices attract or perpetuate listed species.

What are Candidate Conservation Agreements with Assurances (CCAAs)?

CCAAs are voluntary agreements with the USFWS designed to provide incentives for private and other non-federal landowners to conserve **non-listed species** that are candidates for protection under the Endangered Species Act (USFWS 2011b). A CCAA must be entered into, or at least applied for, prior to the listing of a species. CCAAs provide assurances that, if landowners engage in specified voluntary conservation activities and the species of interest later becomes listed, the landowner will not subsequently be required to implement additional conservation measures.

The Mitigation Hierarchy

Energy companies that disturb the landscape must first avoid and minimize disturbance as much as possible. Only impacts that cannot be avoided, minimized, or otherwise reclaimed can be offset by off-site compensatory mitigation (U.S. EPA and DA 1990; McKenney and Kiesecker 2010).

private land through a conservation bank or conservation exchange. Conservation banks and conservation exchanges can be accessed by buyers needing to offset unavoidable impacts to listed or candidate species under the Endangered Species Act (USFWS 2003).

How does a conservation bank work?

Conservation banks permanently protect land for habitat and other natural resource values to mitigate for habitat loss elsewhere (USFWS 2012). Landowners generate credits by enrolling acres or parcels of land that have habitat value with agreements to preserve and manage the land in perpetuity. Resulting mitigation credits are held by a conservation bank with a defined service area. Credits may be sold to buyers within the service area who need to compensate for unavoidable impacts from development elsewhere. For example, a potential buyer would be an energy company required by regulatory agencies to purchase credits to offset a disturbance the company has made on the landscape. The USFWS has approved nearly 150 conservation banks in 14 states (USACE 2017). Well over half of these banks are in California with most others in the southeastern United States.

How does a conservation exchange work?

A conservation exchange is similar to conservation banking but with a few notable differences. First, conservation exchanges may allow term contracts rather than requiring preservation of land in perpetuity as long as the conservation occurs for at least the length of the disturbance being offset. Second, a conservation exchange seeks to establish landowner contract templates and obtain necessary regulatory approvals upfront, so landowners who later choose to participate find generating and selling conservation is as easy as possible. Conservation exchanges for greater sage-grouse (*Centrocercus urophasianus*) are in development or operational in Colorado, Montana, Nevada, and Wyoming. Since it is a new idea, policymakers and advocates in different states are working out many details. For example, how will buyers and sellers find each other? How will prices be determined? Will buyers and sellers negotiate both price and quantity for traded conservation? How much oversight will the relevant regulatory agencies have over transactions? Many of these questions remain relevant for conservation banking even though it has been in place longer.

Tying mitigation to markets

Market-based approaches to compensatory mitigation have the potential to efficiently value habitat resources, compensate landowners for providing them, and better allocate conservation efforts (Pindilli and Casey 2015). Conservation banks and conservation exchanges are recognized under the Bureau of Land Management and USFWS Compensatory Mitigation Policies, regulations designed to provide clear, consistent measures for compensatory mitigation on a landscape level (BLM 2016a; BLM 2016b; Federal Register 2016). Conservation banks and conservation exchanges can be considered conservation markets, as they use market-based approaches to acquiring compensatory mitigation.

How can agricultural markets inform conservation market design?

Once established, a conservation market (for either conservation banks or conservation exchanges) shares many features with other agricultural markets. What do we already know about these markets that could shed light on how to effectively establish a conservation market?

Setting up a market requires:

- Choosing the appropriate trading institution (for example, an auction or privately negotiated contract),
- Determining what information should be available to market participants, and
- Deciding on the delivery method (whether goods are first produced then sold or are contracted for sale and then produced to meet that agreement).

The number of buyers and sellers likely to participate in the market informs many of these decisions.

University of Wyoming research has studied how different market characteristics can affect sellers, buyers, and overall market performance. Most of this research has used experimental markets in which buyers and sellers perform transactions in a laboratory setting. Actual data from private contract transactions can be difficult to obtain. Bringing buyers and sellers into a laboratory market allows economists to control outside factors that can impact market outcomes.

Experimental markets link economic incentives, trading rules, and behavioral norms allowing researchers to capture human tendencies in economic settings. Participants acting as buyers and sellers are given a basic good they buy and sell and are paid in cash based on their individual profits earned. Like real-world

Market Lingo

Market or exchange – The business of buying and selling a good at an agreed upon price.

Trading or market institutions – Exchange mechanisms such as auctions or contracts through which buyers and sellers arrive at prices and terms of trade.

Competitive Trading Institution – A trading institution with rules that facilitate transactions with prices determined in a competitive environment. For example, a double auction where multiple buyers and sellers actively bargain through public bids and offers.

Market concentration – The degree to which a small number of buyers or sellers account for a relatively large percentage of the market.

Thin market – A market with insufficient transactions for efficient price discovery that provides an appropriate value for the good being transacted.

Price discovery – Process by which buyers and sellers arrive at a transaction price that clears the market for the offered good in the negotiation.

Competitive price – A market-clearing price established in a market where the appropriate quantities are supplied and demanded.

Advance production or spot delivery – Sale occurs after production. Sellers risk losing some or all of the production costs for inventory not sold or sold at a price below cost of production.

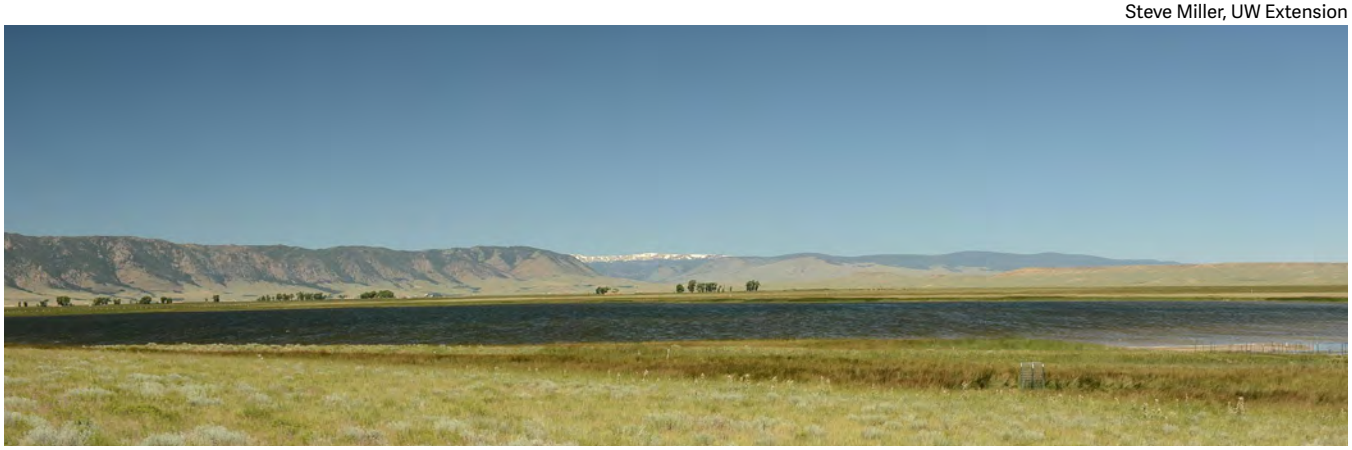
Production-to-demand or forward delivery – Sales contracted before production.

Intermediary – An economic agent who purchases from suppliers for resale or who helps buyers and sellers meet and transact.

Bargaining behavior – Interactions between buyers and sellers in trading that may be affected by values, generosity or expectations of fairness, cultural norms, or personal relationships, for example.

Experimental economics – Simulated, laboratory, and field methods used to investigate questions about economic decision-making and market behavior.

Steve Miller, UW Extension



markets, individual profits may vary depending on the decisions made while negotiating a transaction.

What are some different market institutions that could be considered?

A number of types of trading institutions guide price discovery in markets. Some of these are familiar to a general consumer, while others are commonly used in particular agricultural markets.

- A grocery store is an example of a **posted offer market**. The seller posts a price for which they are willing to sell a good. The buyer then decides to purchase the good or not based on that offered price. There is no negotiation or price haggling between buyer and seller in this type of institution.
- Grain markets often have transactions that occur in a **posted bid auction.** Here the buyer posts a bid price they are willing to pay for a particular type and quality of grain. The grain seller then chooses to accept or reject that price. The buyer may or may not come back with a higher bid if the seller rejects the first bid price.
- Futures markets for many agricultural commodities use a **double auction** institution where multiple buyers and sellers engage in bargaining at the same time. Buyers make bids and sellers make offers. All bids and offers can be seen by all buyers and sellers, making this institution very information-rich. Bids become progressively higher and offers become progressively lower until a buyer and seller agree on a price. This is a very competitive institution, resulting in a quickly discovered negotiated price.
- **English auctions** are quintessential "outcry" auctions used to sell products such as livestock, wine, hay, and farm machinery. The seller typically brings the commodity or good to the auction, and buyers are physically present. An auctioneer facilitates the bidding of buyers, starting by announcing an opening bid or reserve price. When a buyer signals a willingness to purchase at that price, the auctioneer shouts a new higher bid level until no buyers indicate they are willing to pay that final bid level, and a sale is made at the highest accepted bid price. Sellers are relatively passive in an English auction, but they can choose to "no sale" at that final price.
- A buyer and seller negotiate directly with each other in **private negotiation** by making bids and offers until they agree on price. Nearly 40 percent of the value of all agricultural goods sold in the U.S. is done via private negotiation (McDonald and Korb 2011). Each transaction happens between a single buyer and seller in determining price. Typically, the negotiated price is private information known only by the parties involved in the transaction.

Does each institution give the same market results?

Research at the University of Wyoming finds that prices, quantities traded, and resulting relative buyer and seller earnings can all be influenced by the trading institution. For instance, sellers do particularly well in competitive institutions such as English or double auctions (Menkhaus, Phillips, and Bastian 2003). The double auction with forward delivery generally results in a competitive price. This is related in part to the competitive nature of the auction (where multiple buyers and sellers are interacting simultaneously) and its information-rich environment (all traders are able to see all bids and offers and final prices on all trades as they occur). In the case of spot delivery (sellers bringing previously produced goods to market),

quantities produced and traded are also affected. Sellers learn from price signals provided in the market in determining how much to produce. If prices are low, sellers produce less; lower production volume increases prices, which can increase seller earnings.

The advantage for sellers in a more competitive trading institution is lost, however, when trading is conducted via private negotiation. With this one-on-one bargaining institution, the price advantage shifts to the buyer, particularly for spot delivery. Limited opportunities to match and trade with buyers exacerbate sellers' risk of being left with unsold inventory in private negotiation. Research at the university found that in markets with the same underlying supply and demand, with spot delivery, prices in private negotiation markets were 29 percent lower than English auctions and 15 percent lower than double auctions, disadvantaging sellers (Menkhaus, Phillips, and Bastian 2003).

The authors conclude the private negotiation trading institution itself, coupled with spot delivery of products, gives buyers a bargaining advantage. This is partially because sellers will accept a lower price just to cover at least part of their production costs.

While auctions offer higher prices, other experimental research has found English auctions can be susceptible to factors that facilitate collusive behavior as the number of buyers decrease (Phillips, Menkhaus, and Coatney 2003). As fewer buyers participate in an English auction, the opportunities for collusion between buyers to influence prices increase (Phillips and Menkhaus 2009).

So different trading institutions do matter. Within a conservation market, sellers would probably prefer an English auction to a private negotiation since they would likely get a better price for their conservation credits. However, if there are few participants, this potential advantage may be reduced or not exist because of potential for collusion or simply because the market becomes thin.

Market concentration and thin markets

Results can vary when markets have few participants and few transactions. This type of situation is called a **thin market**. As volume of transactions in a market become few, the prices established may not accurately reflect the supply and demand conditions (Tomek and Robinson 1990). Thin markets may also be susceptible to manipulation and pricing imperfections. These pricing imperfections can occur because interested buyers or sellers may not be present in the market at precisely the time when someone else is ready to negotiate a transaction.

Research at the University of Wyoming finds this matching problem – with buyers and sellers not being able to find each other at the right time when they need to buy or sell – is worsened in privately negotiated markets where buyers and sellers have fewer opportunities to negotiate (Menkhaus et al. 2007). In markets where everything else is the same but where buyers and sellers have 40 percent fewer opportunities to match up, prices drop by 12 percent – a boon for buyers. This drop in price can worsen if the number of buyers decreases relative to the number of sellers in a privately negotiated market.

Further research finds that, when a privately negotiated market drops from four to two buyers, even with increased opportunities to match, prices drop 23 percent below the competitive price (Menkhaus et al. 2007). Price moves in the other direction if seller numbers decrease relative to buyers, with prices at or slightly above competitive price levels. That is, concentrating sellers can overcome some of the issues with private negotiation and matching problems in this type of market setting.

Thin markets are expected in conservation markets

Conservation markets are likely to be thin, at least in the beginning. There are unlikely to be many energy companies requiring compensatory mitigation at a particular time and location, so the credit demand side of conservation markets is likely to be relatively small for a given area. In fact, there may not be more than one energy development project in the planning stages at any one point in time and location, so there may not be more than a single buyer. In this case, research suggests landowners who potentially sell conservation credits as a group might be better off than if they sold separately. This could be true even if private negotiation is the institution used rather than an auction.

If landowners were unwilling to sell as a group, they would likely be at a disadvantage, particularly if private negotiation were the institution used. Research by Menkhaus et al. (2007) suggests landowners who have invested in producing credits could wind up selling at below their cost of producing the credit in private negotiation when they have few opportunities to match with other buyers. This risk of receiving prices below their cost of production could potentially be reduced if a reservation price were set by sellers in an auction setting. If a reserve price is known, an auction with few

Pay-for-performance provides stronger ecosystem service protection (at least in theory and under many circumstances) and greater support from regulatory agencies and environmental organizations but also places the risk on landowners if conservation outcomes are not achieved.

Wyoming ranchers have expressed a strong preference for **pay-for-practice,** especially given the difficulty of improving upland sagebrush habitat in harsh, semi-arid conditions typical in the Intermountain West (Duke, Pocewicz, and Jester 2011; Hansen et al. 2015).

buyers will converge on the reserve price as the price level. If the reserve is private, and it is essentially only announced that a bid is below the reserve price, but the reserve price is not announced, bidding can push prices above the reserve price (Simonsohn and Ariely 2008; Choi, Nesheim, and Rasul 2016). Sellers setting a private reservation price in an auction to cover at least their costs to produce the credit can be a way to reduce their loss risk.

Lack of volume and resulting thin markets can actually change market outcomes (price, quantity, profits, and distribution of profits between buyers and sellers) across institutions. In general, markets with more buyers and sellers tend to have higher trade volume, higher overall profits, and a more even distribution of profits between buyers and sellers. One way to improve market outcomes for habitat markets would be to have intermediaries or brokers search for willing buyers and sellers. This could reduce uncertainty and potential search costs for conservation buyers and sellers. Research suggests the presence of intermediaries can improve market outcomes if buyers and sellers are spread out geographically or face costs trying to find trading partners (Spulber 1996; Menkhaus, Yakunina, and Herz 2004).

Pay-for-practice versus pay-for-performance

Deciding exactly what "good" is being traded is another issue important to setting up conservation markets. When the good being traded is a conservation credit, state and federal public land management and wildlife agencies are key in defining what actions must be taken to ensure a credit remains viable for the entire life of the offset. Further, buyers, sellers, and regulators must trust the tools and quality control provisions established to quantify, verify, and track conservation credits.

One defining feature of a conservation market is whether sellers pay for conservation practices they undertake (for example, cheatgrass removal) or for measureable outcomes that result from those practices (for example, enhanced sage grouse habitat). That is, landowners could be paid for implementing practices (**pay-for-practice**) or for achieving conservation (**pay-for-performance**). When a conservation market is pay-for-performance, a landowner cannot generally sell conservation credits until habitat quality has been quantified and verified by a third party. In cases where conservation credits are awarded for existing high-quality habitat, there is relatively little lag time between when the landowner decides to sell credits and when he can market them. However, in cases where a landowner chooses to enhance habitat, time may pass between when practices are implemented and when credits can be verified and marketed. Landowners may not have or be able to carry their costs from implementing conservation practices if credits cannot be marketed quickly. There also is the risk that management practices undertaken will fail to result in measurable conservation. We call this **non-attainment** risk.

Regulators and environmental organizations naturally prefer pay-for-performance whenever possible because they prefer credits only be issued for achieved conservation. Although landowners strongly prefer pay-for-practice, the reality is regulators increasingly require conservation programs to be pay-for-performance whenever possible. What are the implications of pay-for-performance conservation programs for landowner participation and profits?

Paying for performance versus practice is akin to the distinction between two basic delivery methods in agricultural markets: advance production (where sellers choose how much to produce before taking it to market, that is, they incur production costs in advance of sale) and production-to-demand (where sellers contract with a buyer and then produce to fill the agreement, that is, incur production costs after the sale is negotiated). When non-attainment risk is taken into account, a landowner producing conservation credits bears a risk similar to an agricultural producer who incurs the cost of production before knowing the marketing outcome.

Research at the University of Wyoming suggests the more risk sellers face, the weaker their bargaining position and the more likely they are to reduce how much they are willing to produce for the market

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Pay-for-performance, Non-attainment Risk, and Matching Risk

At least one party bears the risk of non-attainment no matter how a compensatory mitigation program is structured. Under pay-for-practice, if the desired conservation outcome does not occur, the buyer may not get an acceptable mitigation and face other penalties from the regulatory agency. Under pay-for-performance, landowners bear this production risk. Landowners also bear matching risk in the market: Let's say four landowners have implemented practices to generate conservation. Four years later, the desired conservation outcome has been achieved and the four landowners can now look for a buyer. There happens to be just one buyer in the area, and only one of the landowners' credits will be purchased. Will the landowners' reservation price cover all of the costs listed above, or will it just cover the variable costs associated with monitoring and maintaining the credit moving forward? Economic theory suggests the latter.

(Menkhaus, Phillips, and Bastian 2003; Menkhaus et al. 2007; Nagler et al. 2015). Fewer credits would likely be produced if landowners must incur the costs of producing conservation credits before they can bring them to market. Credit production is likely to be even lower if sellers also receive lower prices and there are relatively few buyers in the market. Market risks that may lower prices or limit quantities produced could ultimately limit the amount of habitat created, improved, or maintained.

Conservation Easements versus Conservation Enhancements, and Non-Attainment Risk

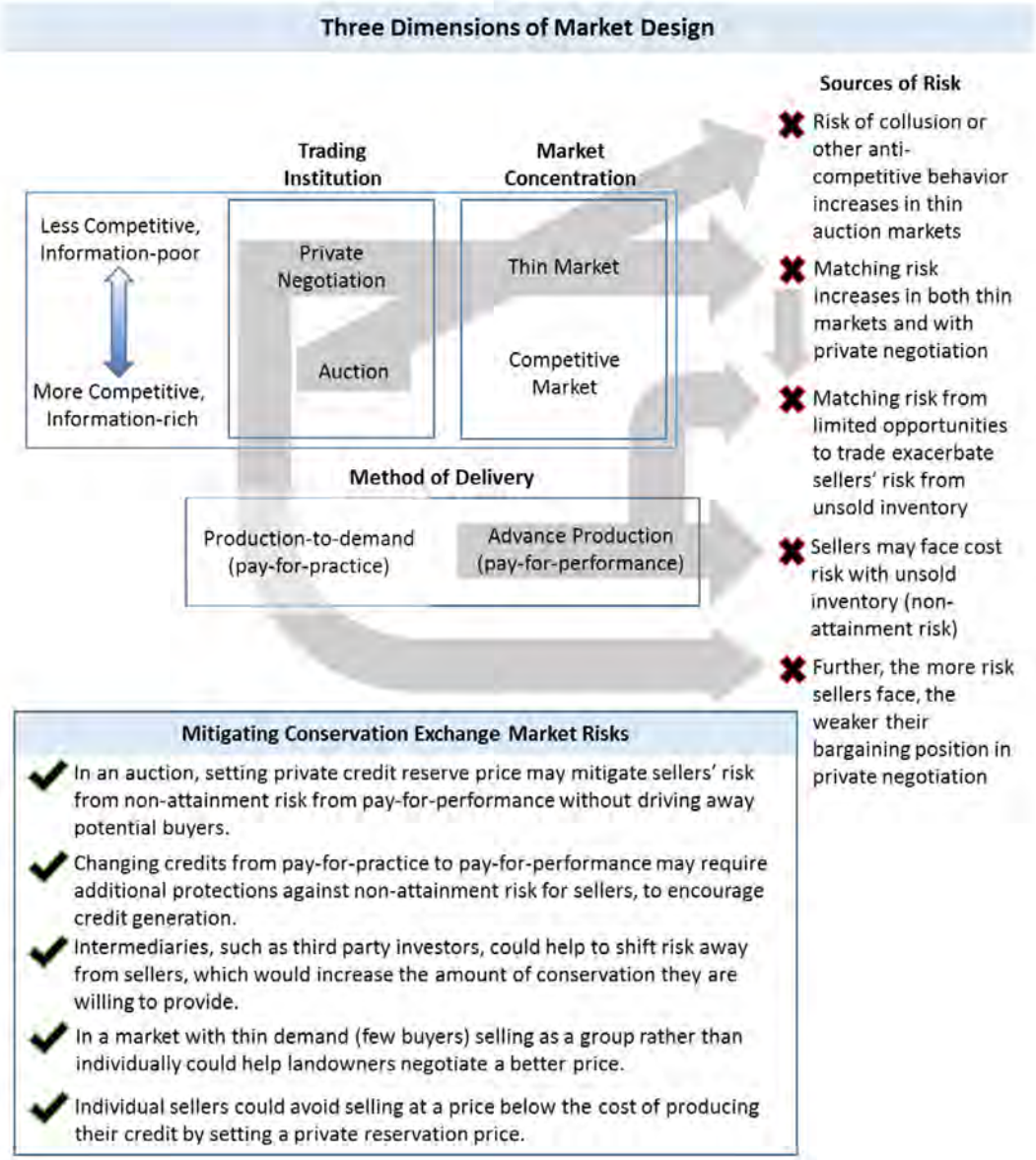
The discussion in this bulletin is most relevant to conservation credits approved for habitat **enhancement** above some pre-existing condition or standard of habitat quality. A significant cash outlay will likely be needed for such credits when the risk of non-attainment exists. Wyoming regulators are, however, also likely to approve conservation credits for **preservation** and maintenance of existing high-quality sage-grouse habitat. These preservation credits are a type of conservation easement that could be approved for a set duration or in perpetuity. Preservation credits have lower cash outlay requirements and lower risk of non-attainment.

What does this all imply for setting up a conservation credit market?

Past research has shown trading institutions (auction, private negotiation) influence market prices, quantities traded, and buyer and seller earnings in agricultural markets. Prices generally are higher in auction institutions (in the absence of collusive behavior) compared to private negotiation. Delivery method can also affect market outcomes; sellers risk not selling their full inventory or selling some units below their incurred costs under advance production. This risk, along with matching risk, places sellers at a bargaining disadvantage relative to buyers in private negotiation, which tends to result in lower prices and quantity sold. As sellers face higher risks, they will likely reduce the quantity they are willing to produce for the market. Low transaction volume (a thin market) can affect market outcomes; prices tend to be lower when sellers outnumber buyers. Interactions between trading institution, delivery method, and transaction volume can intensify differences in prices, quantities traded, and outcomes for buyers versus sellers. Market intermediaries acting to find and match willing buyers and sellers, facilitate transactions, or hold credits for resale could mitigate matching risk in geographically constrained market areas. Sources of risks across trading institutions, market concentration, and methods

of delivery, along with mitigating conservation market risks, are detailed in the following figure.

These results are based on laboratory experiments conducted to better understand agricultural markets. There is, however, no reason to believe results would differ much when the good being traded is a conservation credit rather than a more conventional agricultural commodity. This bulletin indicates the importance of thinking about market design when setting up a conservation bank or conservation exchange, as the rules of trading can affect market outcomes for buyers and sellers. As these markets are being designed, the implications of choosing trading institutions and addressing the risks of the parties involved needs to be considered carefully. A well-designed and properly functioning market provides good economic incentives for potential buyers and sellers to generate habitat, which may ultimately generate higher levels of habitat conservation at lower regulatory cost than would otherwise exist. A poorly designed market, on the other hand, at best will not achieve what is hoped for, and at worst will fail.



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