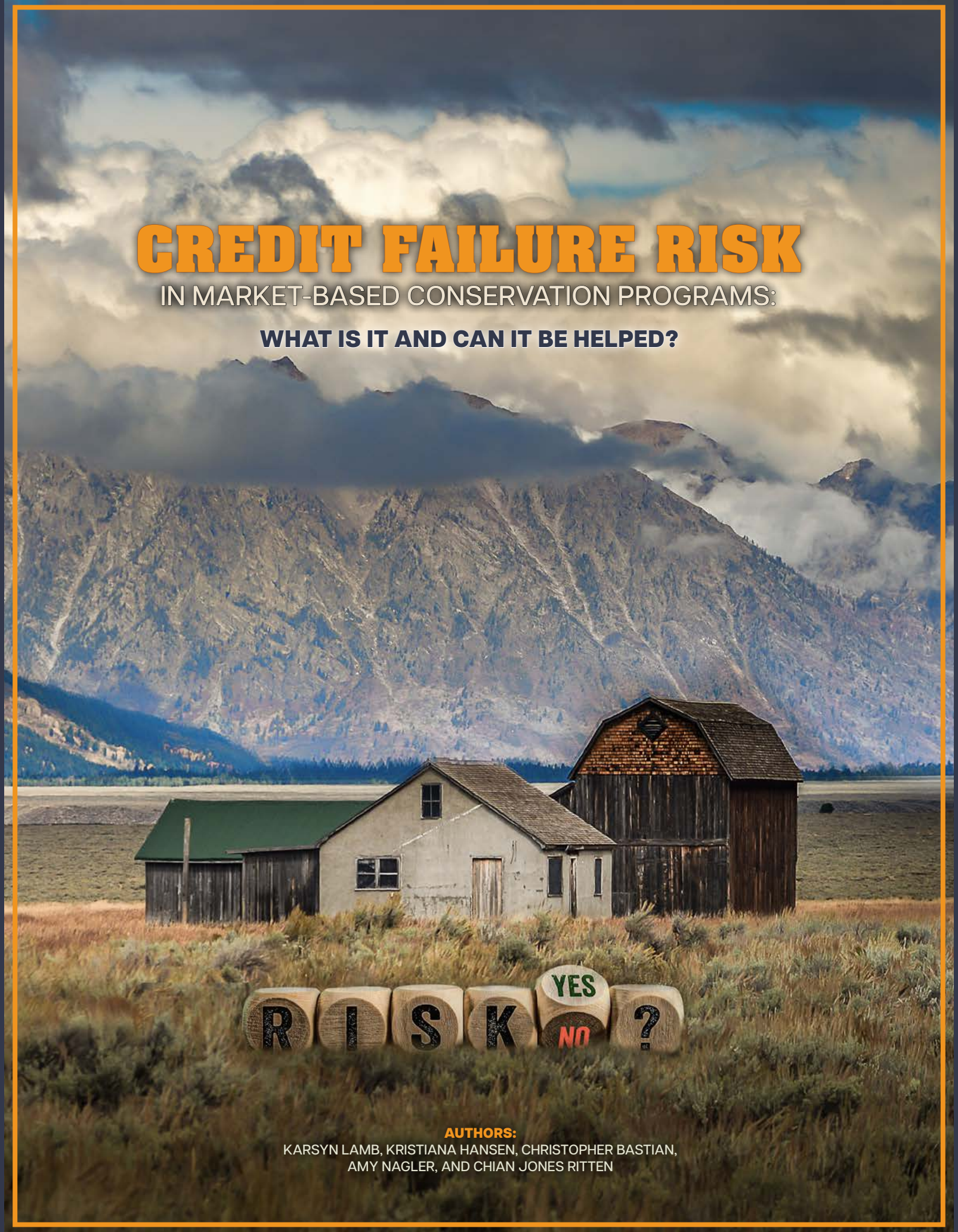
CREDIT FAILURE RISK

IN MARKET-BASED CONSERVATION PROGRAMS:

WHAT IS IT AND CAN IT BE HELPED?



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INTRODUCTION

Privately owned agricultural lands provide habitat for many wildlife species in the western U.S. Policymakers seeking to protect these lands want to do so as efficiently and cost-effectively as possible. In recent years, conservation banks and conservation exchanges have emerged as two market-based approaches for habitat preservation. In both approaches, landowners generate conservation by enrolling parcels of land with agreements to preserve, manage, or enhance habitat value. Resulting conservation "credits" can then be sold to developers seeking to offset unavoidable impacts from projects that disturb the landscape.

Credits might be purchased for disturbances such as roads and well pads from oil and gas development or pits from coal extraction. Both conservation banks and exchanges use market forces to achieve compensatory mitigation through voluntary transactions between landowners and developers, and thus are known as market-based conservation programs.

INSET 1

WHAT IS THE DIFFERENCE BETWEEN CONSERVATION BANKS AND CONSERVATION EXCHANGES?

Conservation banks protect land in perpetuity. They were first set up by the U.S. Fish and Wildlife Service in 1995 to offset disturbances to habitat of threatened and endangered species. More recently, conservation banks have been established to protect habitat of other species of concern, such as the greater sage-grouse (*Centrocercus urophasianus*).

Conservation exchanges allow for term leases in which conservation credits are enrolled in the program for only a specified number of years. This newer approach offers an alternative to the traditional conservation bank concept.

INSET 2.

WHAT ARE THE POTENTIAL BENEFITS OF MARKET-BASED CONSERVATION?

Increased conservation: If market-based conservation makes it easier for landowners to generate and sell conservation, they may increase the amount and quality of habitat in the landscape.

Additional income source for landowners: After generating conservation through preservation or enhancement of habitat on their private lands, landowners can sell conservation credits to developers.

New restoration option for developers: In cases where developers are required to offset environmental damages caused by their projects, market-based conservation provides an avenue for meeting restoration requirements.

INSET 3

TYPES OF RISK IN MARKET-BASED CONSERVATION PROGRAMS

Matching risk: Buyers and sellers risk not finding a willing trading partner. This risk is typical of private negotiation markets and could be significant in programs where buyers are required to find a seller and purchase conservation credits within a particular geographical area.

Inventory loss risk: Sellers risk losing some or all of the costs of management practices for credits not sold, or sold at a price below these costs.

Credit failure risk: The post-production risk that verified conservation credits fail to maintain habitat quality over their contract life.

Generating and selling conservation in a market is risky. If these markets have too much risk, landowners, regulators, and developers may not have enough incentive to participate. For market-based conservation programs to be successful, risks associated with possible market characteristics must be addressed. Risks common to agricultural and environmental markets include matching risk and inventory loss risk. However, credit failure risk is an additional risk unique to market-based conservation.

Once a conservation credit is produced and verified, landowners must sustain habitat quality over the life of the credit's contract by performing various management practices. Credits fail when habitat quality is not maintained to the standards set in the contract.

Credit failure can occur for various reasons. Some species live in areas where necessary vegetation is difficult for landowners to sustain. Invasive species and natural disasters like wildfires may also impact a landowner's conservation efforts. Landowners whose credits

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fail have already incurred costs to implement management practices, and also risk receiving no income for the failed credits. This credit failure risk makes participating in market-based conservation programs unpredictable and potentially costly for landowners.

INSET 4

CREDIT FAILURE RISK EXAMPLE

One way to think about credit failure risk is to consider a market for organic potatoes. Say John is an organic potato farmer. He has to pay a third-party certifier to verify that his potatoes are organic. If John were to sell some of his potatoes as organic, but the certifier later determined these potatoes did not meet organic certification, then John would likely have to recall those potatoes. In this case, John would have to reimburse the buyers and would still have to pay for all production practices along with paying the certifier. Thus, John would lose all income from selling these potatoes, but still have to pay for all his production costs. This risk that John faces is similar to the credit failure risk faced by landowners in market-based conservation programs.

Credit failure risk also threatens developers who have purchased credits and policymakers interested in maximizing conservation on private lands. Although a developer does not have to pay a landowner for purchased credits that fail, the developer still loses time and resources in finding another way to meet mitigation or restoration requirements (perhaps by finding another credit seller). Since credit failure risk may discourage participation in market-based conservation programs, policymakers risk funding a program that attracts limited participation, fails to generate or preserve habitat, or both. In these ways, credit failure risk potentially harms all parties involved in **market-based conservation programs.**

Mechanisms that reduce credit failure risk or allow buyers and sellers to share the consequences of credit failure risk may lower barriers to entry for participants, thereby encouraging more conservation. One way to account for credit failure risk is through reserve accounts, in which a set percentage of each project's credits (e.g., 10%) are held in reserve in case of credit failure. In such markets, sellers may use these reserve credits in case of a natural occurrence, or "act of god," such as a wildfire or catastrophic flood. A reserve account may be shared across all credit sellers, or credit sellers may be required to hold individual reserve accounts (and rely on their own account in case of credit failure). The individual reserve account approach may make it more difficult for small landowners to participate in conservation markets.

Another approach to manage credit failure risk would be to hold the seller free of liability if credits fail due to a natural occurrence outside the control of the seller and buyer. In this instance, the regulatory authority would have primary responsibility for the failed credits and might fund credit replacement through taxpayer dollars or a fee levied on all credit transactions. This approach would increase program costs to the regulatory authority and to the public, which might not be feasible given authority budgets and public sentiment.

Buyers sharing credit failure risk with sellers could ultimately encourage increased participation by landowners and reduce search costs for developers looking for credit suppliers. It is unknown how risk sharing would affect participation

See inset 3 for a description of these market risks. Also see Hansen, Bastian, Jones Ritten, and Nagler 2017 for more detail.

in market-based conservation programs. We use existing studies about agricultural commodity markets as a foundation for answering some of these questions, given the similarities between market-based conservation programs and agricultural commodity markets. Past market studies conducted at the University of Wyoming have explored how market structure and associated risks affect outcomes such as price, quantity traded, and benefits of trading for buyers and sellers (Menkhaus, Phillips, and Bastian 2003; Menkhaus et al. 2007; Nagler 2015). See Hansen, Bastian, Jones-Ritten, and Nagler (2017) for a summary of this research.

In the present study, we examine whether having buyers share credit failure risk in a conservation market could entice landowners to generate and sell more conservation credits. We use a market experiment to evaluate a reimbursement mechanism that shares the risk of credit failure between buyers and sellers. Under the reimbursement mechanism, credit buyers pay landowners for management costs associated with failed credits, which could help landowners view market-based conservation programs as less risky and encourage more participation.

METHODOLOGY

Market experiments: How do they work?

Since many market-based conservation programs are still in development, real-world transaction data are scarce. Even in functioning programs, price data are difficult to obtain. Since people are found to act similarly in experiments as they do in real life, experimental markets can provide insights into market behaviors and design (Nagler et al. 2013).

To test how credit failure affects risk in market-based conservation programs, we set up an experimental market in a computer laboratory at the University of Wyoming. We also evaluated a reimbursement mechanism in which buyers cover the costs of sellers' management practices for credits that fail.

In our experimental market, each participant was first assigned to be either a buyer or a seller of credits. Sellers represented landowners, while buyers represented developers. Sellers were given a production cost (representing the costs of management practices to produce credits) and buyers a resale or redemption value (representing the value to a buyer of conservation credits) for each credit available for them to trade. Buyers and sellers were also informed in advance whether credits might fail and if so, the probability of failure.

Sellers then produced and traded conservation credits with buyers. Trades between buyers and sellers were conducted on computers where they negotiated directly by making offers and counteroffers until they agreed upon a price. Credits were traded using an imaginary currency called "tokens," which were exchanged for real dollars at the end of experiment. The payment of real cash created a profit incentive to induce realistic market behavior for all market agents.

These experimental markets are not designed to be completely realistic; rather, they are designed to isolate key market features to help us understand how market-based conservation programs operate.

RESULTS

Using data collected from the experimental markets, we determined the quantity of credits traded, the average price at which credits traded, and the amount participants earned during the experiment. We compared these market outcomes across experimental treatments (some with credit failure risk, some with both credit failure risk and the reimbursement mechanism) to determine which market structures generate the most conservation and have the

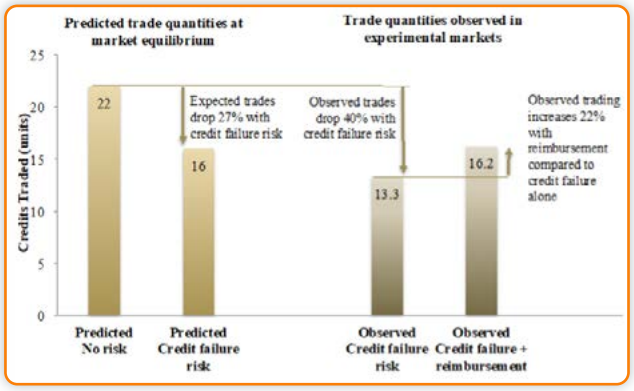
highest earnings—and thus the highest incentive to participate.

Quantity of Credits Traded

The overall quantity of credits traded is important because it represents the amount of conservation generated. Figure 1 highlights the predicted and observed quantity of credits traded in our experimental markets with four buyers and four sellers. Predicted credits traded is the quantity of credits that would be traded solely based on the production costs and redemption values given to buyers and sellers in a competitive market.

In experiments, as in real life, uncertainties about finding a trading partner and negotiating price generally mean that fewer credits than predicted are traded. Predicted outcomes (for earnings as well as credits traded) provide a benchmark for understanding how different market features affect trader ability to increase earnings and quantity traded, as well as overall market effectiveness.

FIGURE 1. *QUANTITY TRADED*



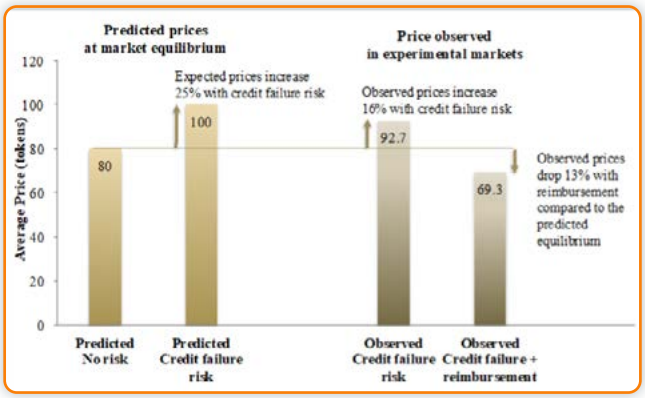
In a market with no credit failure risk or reimbursement, we predicted that 22 credits would be traded, based on production costs and redemption values. When buyers and sellers fully take into account credit failure risk, the quantity traded is expected to drop about 27% (from 22 to 16 credits). However, in an experimental market with credit failure risk present, credit quantities traded dropped about 40% (from 22 to 13.3 credits) compared to a market without credit failure risk. The amount of credits traded in the market with credit failure was 17% below the predicted value (from 16 to 13.3 credits), indicating actual credits generated could be even worse than expected with the existence of credit failure risk. These findings affect both developers and landowners—in a market with credit failure risk, developers will struggle to meet regulatory requirements for restoration, and landowners will earn less income as a result of selling fewer credits.

The results for a market with reimbursement for credit failure risk are even more interesting. This market is the same as the market with credit failure risk except that buyers pay sellers for their production costs on failed credits. Quantities traded in the experiment rose about 22% (from 13.3 to 16.2 credits) with this reimbursement present compared to the market with credit failure alone. Reimbursing landowners for their costs associated with credit failure lowers the overall cost to landowners of generating and trading credits. Because reimbursement lowers landowners' risk of incurring costs from producing failed credits, they can sell credits at lower prices, enticing developers to buy. This increased activity causes an overall increase in credits traded and is expected to increase conservation.

Conservation Credit Price

Conservation credit price is an important indicator of market-based conservation. We predicted that the price of a conservation credit in a market with no credit failure risk would be 80 tokens. In the market with credit failure risk, we predicted conservation price to increase by 25% given the reduced supply of credits actually available after failure (from 80 tokens to 100 tokens). Figure 2 below shows both predicted and actual prices for markets with credit failure and with reimbursement in place.

FIGURE 2. *CONSERVATION PRICE*



Conservation credit price in the market with credit failure risk was about 16% higher than the predicted price in the market with no credit failure risk (92.7 tokens instead of 80). This increase in conservation price reflects the increased costs sellers face when dealing with credit failure risk—they must charge more to compensate for their losses. Credit price dropped about 25% (to 69.3 tokens from 92.7) when reimbursement was added to the market with credit failure risk. The fact that credit price drops below that of the predicted no-risk market is significant; it shows that reimbursement offsets sellers' costs enough for them to sell at an even lower price than in the market with no risk at all. These data indicate greater potential to improve conservation and outcomes for developers than we would expect from just market theory alone.

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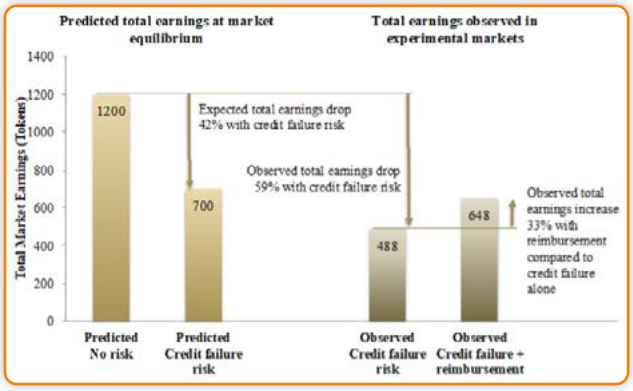
Total Earnings

The sum of all market participant earnings (total earnings is total net income for all buyers and sellers) represents how efficient a market-based conservation program is. If total earnings are low, buyers and sellers are dissuaded from participating and trading, harming how efficiently the market generates conservation. We predicted total earnings to be 1,200 tokens in the market without credit failure risk. We expected total earnings to drop about 42% (from 1,200 to 700 tokens) in a market with credit failure risk (Figure 3).

FIGURE 3 *TOTAL EARNINGS*

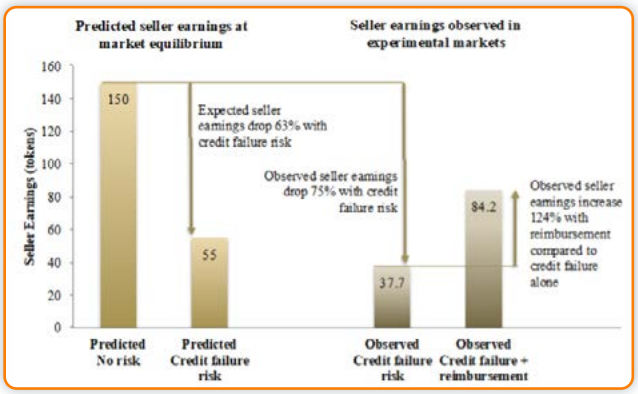


In the credit failure risk market, total earnings fell nearly 60% compared to total earnings predicted in a market with no risk (from 1200 to 488 tokens). This decrease in earnings shows just how detrimental credit failure risk is to market participants. In order to make up for these losses, sellers increase credit prices (see Figure 2). These increased prices force credit buyers to pay more, incentivizing developers to seek out other options to mitigate disturbance. Once reimbursement is added, total earnings increase by 33% compared to earnings in the credit failure risk market (from 488 to 648 tokens). Sellers no longer incur costs on failed credits, keeping prices lower and promoting higher trade volume. This increased volume generates more earnings for all participants in total, resulting in a noteworthy improvement in overall market efficiency.

Seller Earnings

If seller earnings are not high enough, landowners will not participate, conservation will not be generated, and developers will have to find other options for meeting environmental regulatory requirements. We predicted average earnings for a seller to be 150 tokens in a market with no credit failure risk or reimbursement. We predicted that seller earnings would fall about 63% (from 150 to 55 tokens) once credit failure risk was present in the market (Figure 4).

FIGURE 4. *SELLER EARNINGS*



In the market with credit failure risk, seller earnings dropped by 75% (from 150 to 37.7 tokens) compared to the market with no risk. This outcome was worse than we predicted. This drop likely occurred because sellers incur costs to produce the failed credit but are no longer able to earn profit from a credit when it fails.

In contrast, seller earnings in the market with reimbursement rose 124% (from 37.7 to 84.2 tokens) compared to the market with only credit failure risk. This increase suggests that reimbursement for credit failure also combats other forms of risk present to sellers in market-based conservation programs, encouraging more credit production.

Buyer Earnings

In the reimbursement market, where buyers reimburse sellers for production costs associated with a failed credit, we might expect buyers to receive lower earnings. However, results show this is not the case. In fact, although reimbursement does boost sellers' earnings, it does not seem to hurt buyers.

Buyer earnings were not statistically significantly lower in the market with reimbursement relative to the market without. Buyers demanded fewer credits because reimbursing sellers increases the total cost of acquiring a credit. However, sellers produce more credits at a lower cost when they are reimbursed for the cost of failed credits. This reduction in sellers' costs makes sellers more willing to trade credits at a lower price relative to the market with no reimbursement, offsetting buyers' reimbursement costs by generating more profit per credit they purchase.

CONCLUSIONS

Although interest in market-based conservation programs is growing, the presence of credit failure may inhibit the establishment of these programs. Past research has not demonstrated how credit failure risk affects markets with characteristics resembling market-based conservation programs. Nor has past research evaluated how potential solutions for this risk, such as reimbursement, could increase the effectiveness of market-based conservation programs. The results of our study proved both concerning and promising for the future of market-based conservation.

Credit failure risk poses a significant threat to market-based conservation success. Credit quantities traded, conservation credit price, total earnings, and seller earnings all drop dramatically in the presence of credit failure risk. These dramatic drops imply that if market-based conservation programs in the real world do not mitigate credit failure risk, they will likely fail, yielding little to no measurable conservation.

On the other hand, having buyers reimburse sellers for their costs when a credit fails reverses these negative results: credit quantities traded, conservation credit price, and total earnings all rebound to near the expected levels for a market with no credit failure risk. Risk sharing allows market-based conservation programs to operate more efficiently despite the undeniable presence of credit failure risk.

Reimbursement is only one way to create risk-sharing in a market setting. While we proposed the idea of credit buyers funding reimbursement, other options such as insurance policies and tax incentives could also be considered. A market-based conservation program in Nevada, for example, has included a type of risk-sharing in the form of seed funds. These seed funds, provided by the state of Nevada, supply upfront financial and technical assistance for landowners to generate credits. If the credits are sold, the landowners receive additional payments and the state recovers its funding (NCCS 2017).

Our results show the dampening effect that credit failure risk can have on conservation trading and demonstrate how it can discourage buyer and seller participation through reduced earnings. Incorporating some sort of risk-sharing structure in market-based conservation programs is crucial to improved outcomes for conservation, landowners, and developers, which are vital for market success.

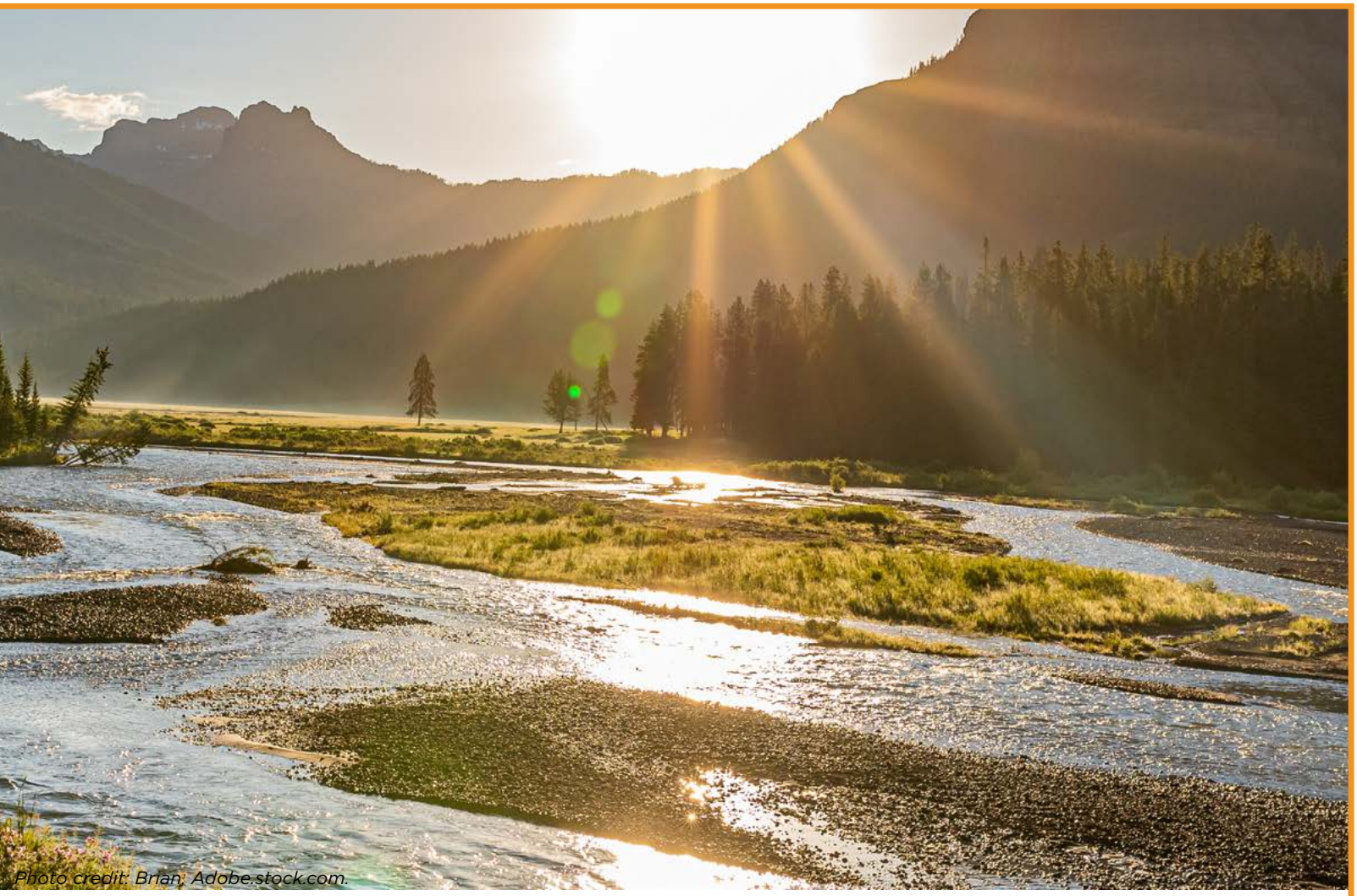


Photo credit: Brian; Adobe.stock.com.

FURTHER READING

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